NASA SP-7011 (194)
June 1979

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Aerospace Medicine and Biology

A Continuing Bibliography with Indexes

National Aeronautics and Space Administration

Aerospace Medicine and Biology
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NASA SP-7011 (194)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 194)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1979 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 223 reports, articles and other documents announced during May 1979 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

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An annual index will be prepared at the end of the calendar year covering all documents listed in the 1979 Supplements.

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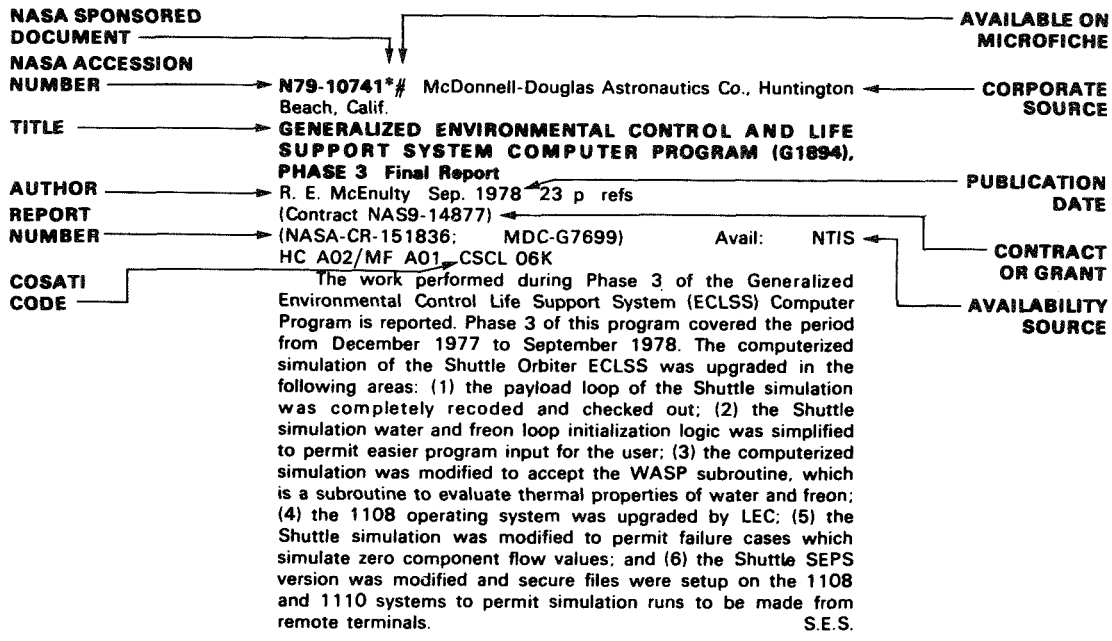

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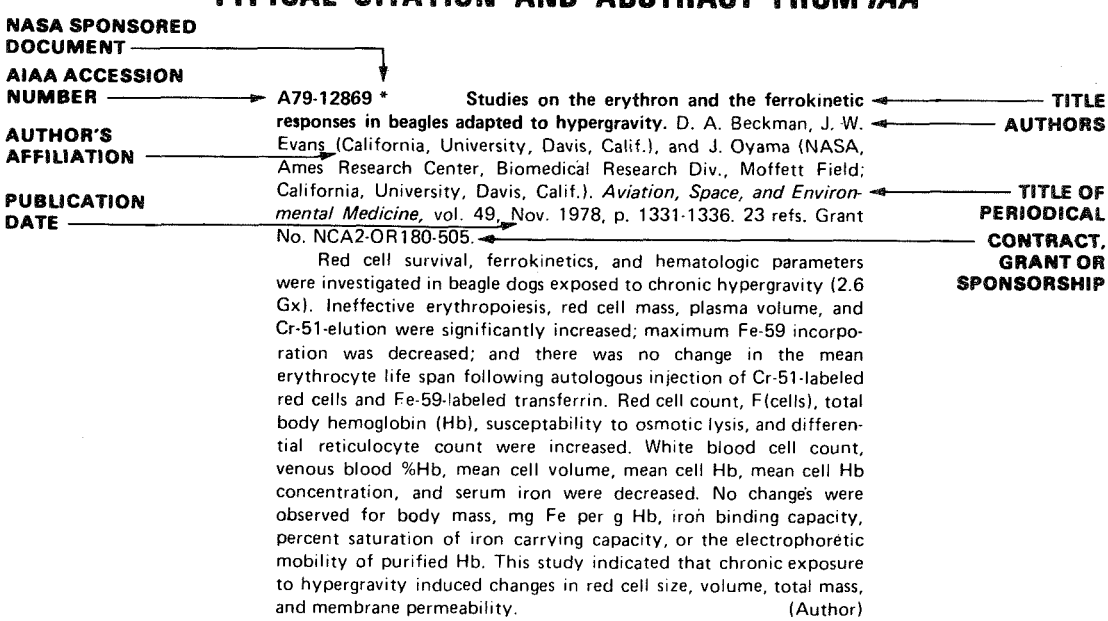

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 194)

JUNE 1979

IAA ENTRIES

A79-24628 **Cardiorespiratory assessment of decongestant-antihistamine effects on altitude, +Gz, and fatigue tolerances.** M. T. Lategola, A. W. Davis, Jr., P. J. Lyne, and M. J. Burr (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 101-109. 16 refs.

Experiments were conducted on volunteer adult male subjects to assess the effects of two decongestant-antihistamine preparations, or a placebo on cardiorespiratory responses to two equally spaced +2 Gz tests during separate 2-h exposures at 388 m, ground level, and simulated 3810-m altitude. Specific parameters evaluated during each experiment were Hr, BP, %HbO2, pulmonary ventilation, and temporal artery blood flow velocity. In addition to these parameters, oxygen uptake was measured during post-altitude bicycle ergometry. It is shown that both medications have no statistically significant detrimental effects on short-duration post-altitude ergometric fatiguability. Except for two subjects, all combinations of medication, altitude, and +Gz were well tolerated. Two subjects suffered clear-cut incapacitation at altitude with the decongestant-antihistamine preparation containing pseudoephedrine hydrochloride and triprolidine hydrochloride. S.D.

A79-24629 **Effect of water and electrolyte replacement during exercise in the heat on biochemical indices of stress and performance.** K. T. Francis (Alabama, University, Birmingham, Ala.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 115-119. 38 refs. Research supported by the Linn Henley Trust Fund.

A79-24630 **Tolerance of domestic fowl to high sustained +Gz.** A. H. Smith, W. L. Spangler, J. M. Goldberg, and E. A. Rhode (California, University, Davis, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 120-125. 11 refs. Contract No. F41609-76-C-0012.

A system is described for the acceleration treatment of domestic fowl. A reasonable endpoint for acceleration tolerance is provided by a bradycardia which occurs fairly close to the lethal limit. In a group of 61 male Rhode Island Red chickens exposed to 6 Gz, the mean tolerance (+ or - SD) was 11.1 + or - 10.6 min. Among individuals, the acceleration tolerance is inversely related to both body size and age, and positively to pretreatment heart rate. (Author)

A79-24631 **Effects of brief exposure of domestic fowl to very intense acceleration fields.** A. H. Smith, W. L. Spangler, B. Carlisle, and G. Kinder (California, University, Davis, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 126-133. 15 refs. Contract No. F41609-76-C-0012.

Since biological responses to high sustained Gz (HSGz) are determined largely by field intensity and duration of exposure, a series of experiments was arranged to emphasize the effects of field intensity. Male Rhode Island Red chickens were given a single standard exposure of 1 min to a field, which increased from 5-18 +Gz for the series. Acceleration-induced changes were observed in heart rate during and after the treatment, and in lymphocyte frequency and body mass maintenance subsequently. Generally, there was an increasing bradycardia and lymphopenia, which was proportional to field strength. Above 13 G, normal growth and even the maintenance of a pretreatment body mass were impaired. (Author)

A79-24632 **Development capacity of artemia cysts and lettuce seeds flown in Cosmos 936 and directly exposed to cosmic rays.** Y. Gaubin, H. Planel, G. Gasset, B. Pianezzi (Toulouse III, Université, Toulouse, France), E. E. Kovalev, and L. V. Nevzgodina (Institute of Biomedical Problems, Moscow, USSR). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 134-138. 5 refs.

A79-24633 **SPH-4 helmet damage and head injury correlation.** B. A. Slobodnik (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, Ala.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 139-146. 10 refs.

Human tolerance to head impact was assessed by correlating the force levels required to duplicate damage seen in 14 SPH-4 aviator helmets retrieved from U.S. Army helicopter crashes with resulting head injury. Head injury occurred at peak acceleration levels far below 400 G, which is the value currently used by the U.S. Army as the pass-fail criterion in evaluating the impact attenuation performance of prospective aircrew helmets. Concussive head injuries occurred below Severity Index values of 1500 and below Head Injury Criterion values of 1000. These are considered concussive threshold values by the National Operating Committee on Standards for Athletic Equipment and by the Department of Transportation, respectively. Because peak transmitted force was the best estimator of the Abbreviated Injury Scale values assigned to the 14 cases, it may be a more effective criterion to use in the evaluation of helmet impact attenuation performance than is peak G, Severity Index, or Head Injury Criterion. (Author)

A79-24634 **Central and cerebral hemodynamics and metabolism of the healthy man during head-down tilting.** V. E. Katkov, V. V. Chestukhin, R. I. Lapteva, V. A. Iakovleva, V. M. Mikhailov, O. Kh. Zybin, and V. N. Utkin (Ministry of Health, Institute of Biomedical Problems and Institute of Transplantation of Organs and Tissues, Moscow, USSR). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 147-153. 29 refs.

Experiments on six healthy test volunteers, who underwent simultaneous catheterization of different cardiovascular compartments, were carried out to study the effect of head-down tilting at an angle of -20 deg on the central and cerebral hemodynamics and metabolism. By the third hour of exposure, the test subjects showed a decrease in the systolic arterial pressure and increases in the systolic pressure of the right ventricle, heart rate, cardiac output, and oxygen intake. They also displayed a trend for an increase in the content of adenosine triphosphate, a decrease in the content of pyruvic acid, and essentially no changes in the concentration of lactic acid and activity of lactate dehydrogenase in the arterial blood and in the blood flowing out from the brain. The oxygen arteriovenous difference for the systemic and cerebral circulation decreased by 24% and 13%, respectively. The above circulatory and metabolic changes seem to reflect processes of adaptation of the human body to functioning under conditions of cephalad fluid shifts. (Author)

A79-24635 **Effects of altitude and two decongestant-antihistamine preparations on physiological functions and performance.** E. A. Higgins, W. D. Chiles, J. M. McKenzie, A. E.

Jennings, G. E. Funkhouser, and S. R. Mullen (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 154-158. 9 refs.

Fourteen men were studied to determine the combined effects of two altitudes - 388 and 3810 m - and three preparations - lactose placebo, Compound A (Actified), and Compound B (Dristan). Subjects reported least attentiveness with A and greatest with placebo. Fatigue increased significantly with time while energy, interest, and attentiveness decreased. The Multiple Task Performance Battery (MTPB) showed no effects of altitude, drugs, or time on overall performance; however, performance declined with time in several tasks, while problem solving improved. Subjects enjoyed the problem-solving tasks and may have given them preference as levels of interest declined. Though the MTPB overall composite scores did not change significantly, physiological parameters and subjective evaluations indicate that type of compound and time after ingestion are important. Declines in energy and attentiveness 2.5 h after ingestion could result in neglect of important though routine tasks. Hypoxia might enhance this effect and consequences might be worse in subjects whose medical conditions require these drugs. (Author)

A79-24636 Time for loss of increased cardiac responsiveness to isoproterenol in cold-acclimated rats after removal from cold. E. A. Miller, M. J. Fregly (Florida, University, Gainesville, Fla.), M. J. Katovich, and C. C. Barney. *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 159-162. 19 refs. Contract No. N00014-75-C-0199; Grant No. NIH-AM-07164-03.

A79-24637 * Caloric and exercise requirements of space flight - Biostereometric results from Skylab. M. W. Whittle (Oxford Orthopaedic Engineering Centre, Oxford, England). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 163-167. 9 refs. Contract No. NAS9-11604.

The biostereometric study of the Skylab astronauts used stereophotogrammetry to make accurate three-dimensional measurements of body form, from which regional and total body volumes were derived. Volume changes in the thighs and calves, over the course of the flight, showed a high correlation with inflight exercise on the bicycle ergometer, and suggested that an exercise level of 80-100 W-min/d/kg lean body mass would be necessary to prevent inflight muscle atrophy. The bicycle ergometer is thus a relatively inefficient means of preventing leg muscle atrophy. Inflight caloric intake showed a high correlation with the change in volume of the buttocks, the abdomen, and the body as a whole, and suggested that a caloric intake of 47-51 kcal/d/kg lean body mass would be necessary to prevent a change in body fat. Only one of the astronauts exceeded this range and gained body fat; the group as a whole showed a mean fat loss of 1.2 kg. (Author)

A79-24638 Evaluation of the helicopter in aeromedical transfers. E. J. Reddick (U.S. Army, Aeromedical Center, Fort Rucker, Ala.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 168-170. 11 refs.

The paper reviews 52 consecutive helicopter-supported aeromedical evacuation requests for both civilian and military patients. Of the 52 missions requested 42 were accepted. The others were refused because the patients were either obviously nonemergency or too unstable for any mode of transport, or because the flight crews were engaged in other missions at the time. Air transfer was always faster, ranging from 15 to 100 min quicker than ground ambulance transfer time. Only 33% of the patients fully benefited from rapid aeromedical transfer, namely surgical emergencies and patients in need of immediate intensive care facilities. It is concluded that speed is the only advantage of the helicopter over the ground ambulance. If the patient does not fall in the surgical or medical emergency category, then he should be transported in a ground ambulance where he can be handled more efficiently. S.D.

A79-24639 * Prevention and treatment of space sickness in Shuttle-Orbiter missions. A. Graybiel (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 171-176. 5 refs. NASA Order T-9140-E.

A status report is presented on assessments of antimotion sickness drugs in slow-rotation rooms and, particularly, with two candidate medications - fixed-dose combinations of promethazine plus ephedrine and a transdermal therapeutic system-scopalamine - that are efficacious over long periods with acceptable side effects. Attention is given to evaluating the use of free fall in parabolic flight as a model for orbital flight to assess the efficacy of antimotion sickness drugs. Experience in slow-rotation rooms suggests that programming adaptation (executing head movements) is significantly superior to random head movements when performing required tasks. (Author)

A79-24640 Ruptured arteriovenous anomaly in a former woman astronaut candidate. R. C. Schneider, B. B. Scott, and E. C. Crosby (Michigan, University, Medical Center, Ann Arbor, Mich.). *Aviation, Space, and Environmental Medicine,* vol. 50, Feb. 1979, p. 182-186. 16 refs.

A case is reported of a 50-year-old right-handed former woman astronaut candidate complaining of the onset of severe headache associated with nausea, vomiting and cervical pain. A bloody cerebrospinal fluid was found, and a right percutaneous femoral arteriogram revealed an arteriovenous anomaly in the right parieto-occipital area. She was operated on, and anterior-posterior and lateral views of the postoperative arteriogram demonstrated a complete removal of the lesion. However, after five months she began to show neurologically positive symptoms, suggesting a focus of irritability probably secondary to postoperative scar formation. The lesion was located in the temperoparieto-occipital area corresponding to the interpretive cortex responsible for inversion of image, disorientation in space, unformed hallucinations and dizziness. In an extremely expensive mission so fraught with hazard, it seems that a CT scan and a four-vessel percutaneous arteriogram are indicated as an integral part of space preflight examination of an astronaut to exclude the possible existence of intracranial vascular lesions. S.D.

A79-24698 The effects of different levels of heat production induced by diathermy and eccentric work on thermoregulation during exercise at a given skin temperature. C. T. M. Davies (Medical Research Council, Environmental Physiology Unit, London, England). *European Journal of Applied Physiology,* vol. 40, no. 3, 1979, p. 171-180. 20 refs.

A79-24699 The local and time-dependent temperature field in the body of a homeothermic organism in case of sudden changes of quantity and local distribution of internal heat production (Das örtlich-zeitliche Temperaturfeld im Körper des Homoiothermen bei sprunghafter Veränderung von Grösse und Verteilung der inneren Wärmeproduktion). B. Theves (Kiel, Neue Universität, Kiel, West Germany). *European Journal of Applied Physiology,* vol. 40, no. 3, 1979, p. 181-196. 9 refs. In German.

For the local and time-dependent temperature field in a homeothermic organism the symmetry of constant mean surface curvature is a geometrical adequate descriptive form. The according form of the partial differential equation of heat conduction with a suitable source function has been solved for sudden changes of the internal heat production. The thermodynamical difference between decrease and increase of the body heat content is discussed. The solution formula is also valid in case of sudden change of heat loss, caused for example by changes of the climatic conditions of the environment, clothing, or wetness of the skin surface. The results of the calculations are in good agreement with experimental data of other authors. (Author)

A79-24700 Pulmonary blood volume and interventricular circulation time in physically trained and untrained subjects. D. K. Falch (Aker Hospital, Oslo, Norway) and S. B. Stromme (Norwegian College of Physical Education and Sport, Oslo, Norway). *European Journal of Applied Physiology,* vol. 40, no. 3, 1979, p. 211-218. 22 refs. Research supported by the Norwegian Council on Cardiovascular Disease and Norwegian Medical Depot.

The relationship between total and pulmonary plasma volumes is studied along with plasma flow velocity and cardiac output. The measurements are performed during rest in the supine position, and a

comparison between trained and untrained subjects (male and female) is made. The parameters measured are the resting pulmonary plasma and blood volumes (PPV and PBV), interventricular circulation time (IVCT), cardiac index and stroke index (CI and SI), heart rate (HR), and total plasma and blood volumes (PV and BV). In addition to high maximal aerobic power, the athletes are shown to have greater SI, BV and PV and lower resting HR than nonathletes. PPV and PBV are significantly larger and IVCT significantly longer in the trained than in the untrained groups. The data demonstrate that the intrapulmonary blood volume varies in proportion to the total blood volume, indicating a fairly uniform enlargement of the vascular system in response to physical endurance training. The reduced plasma flow velocity in the trained subjects indicates reduced kinetic work of the heart. S.D.

A79-24878 Interdisciplinary and international contributions to research on biological effects of electromagnetic waves - Past performances and future challenges. C. C. Johnson. *Radio Science,* vol. 14, Jan.-Feb. 1979, p. 1-4.

Such examples of technological advances in the United States and other Western nations as nonperturbing thermal sensors and dosimeters for measuring whole-body absorption of energy and for determining differential uptake of energy in tissues are discussed. Complementing these advances are those of Eastern investigators who have performed many epidemological surveys and have pioneered studies of behavioral and nervous reactions to long-term, low-level irradiation. The resulting accumulation of data, including those from international programs of scientific exchange, will help provide a sound basis for standards of safety and for beneficial applications of radio frequency energy. B.J.

A79-25098 Useful visual field size for pattern perception. S. Saida and M. Ikeda (Tokyo Institute of Technology, Yokohama, Japan). *Perception and Psychophysics,* vol. 25, no. 2, Feb. 1979, p. 119-125. 25 refs.

The useful visual field size at each fixation in a pattern was investigated by artificially introducing various visual field sizes to a TV display. The degree of pattern perception was measured in terms of recognition memory for pictures, and the speed of processing pictures was determined as a function of field size. A serious deterioration in the perception of pictures occurred as the visual field was limited to a small area around the fovea (about 3.3 x 3.3 deg) the processing speed becoming extremely slow. Speed increased gradually as visual field size increased to a certain level beyond which no further increase was observed. The visual field size at this asymptotic speed, termed the useful visual field, was found to be about 50% of the entire pattern size. Analysis of eye-movement records demonstrated that, in terms of the useful visual field, the scanning characteristics of the eye over the pattern occurred in a heavily overlapping manner to assure good perception of the pattern. (Author)

A79-25099 Locus of the effect of specific practice in continuous visual search. W. Prinz (Bielefeld, Universität, Bielefeld, West Germany). *Perception and Psychophysics,* vol. 25, no. 2, Feb. 1979, p. 137-142. 16 refs. Research supported by the Universität Bielefeld.

Specific practice in a visual search task can result either in a selective elaboration of the feature lists of the task stimuli or in a selective emphasis of their status within the task (targets vs nontargets). According to the first explanation, which is related to the differentiation principle of perceptual learning, specific practice enhances the operation of stimulus identification. According to the second explanation, which is related to the enrichment principle of perceptual learning, it enhances the operation of response selection. Evidence from two transfer experiments with a reversal paradigm argues in favor of the second view, at least for tasks with easily codable letter stimuli. The results are discussed in the framework of a recent model of information integration in visual search. (Author)

A79-25304 # A hazard assessment method for the U.S. Army Microwave Radiation Protection Program. E. R. Carl (U.S. Army, Environmental Hygiene Agency, Aberdeen Proving Ground, Md.). In: International Symposium on Electromagnetic Compatibility, Atlanta, Ga., June 20-22, 1978, Proceedings.
New York, Institute of Electrical and Electronics Engineers, Inc., 1978, p. 44-47. 6 refs.

A basic methodology for microwave radiation hazard assessment and controls implemented by the U.S. Army is presented. Analysis and measurement are used to determine the potential for personnel exposure. Account is taken of large aperture, small aperture and induction-type devices. (Author)

A79-25373 # Aviation-medicine appraisal as part of the fitness regulations in transportation (Die luftfahrtmedizinische Begutachtung als Teil der Tauglichkeitsvorschrift des Verkehrswesens). J. Kressin and E. Schulze (Verkehrsmedizinischer Dienst, Berlin, East Germany). *Technisch-ökonomische Information der zivilen Luftfahrt,* vol. 14, no. 5, 1978, p. 278-284. 5 refs. In German.

One of the main functions of aviation medicine is concerned with an evaluation of the fitness of the flying personnel and of personnel employed in air traffic control operations. In the German Democratic Republic, this fitness appraisal is conducted by the members of an aviation-medicine commission. The first commission for civil aviation began its activities in October 1964. The regulations regarding a certification of the suitability of the subject for his intended employment in aviation are being adapted to the approaches generally used for all persons employed in the field of transportation. A list of the various requirements and involved stresses which might be related to a performance of the job functions is used as a basis for the evaluation procedure. A description is presented of the various steps, procedures, and methods which are involved in the fitness examination. G.R.

A79-25399 Velocity precision in smooth pursuit eye movements. R. A. Williams and D. H. Fender (California Institute of Technology, Pasadena, Calif.). *Vision Research,* vol. 19, no. 3, 1979, p. 343-345, 347, 348. Grants No. NIH-NS-03627; No. NIH-EY-00085.

The study reveals two properties of the smooth pursuit system which have not previously been reported. First, the two eyes when tracking equivalent but independent targets may travel at different velocities, the interocular difference at times exceeding 10% of target velocity. Such variability between left and right eye movements suggests that a velocity control system exists for each eye. Second, a sizable eye/target velocity mismatch is present during most pure velocity tracking movements. The discussion of this point demonstrates the possibility that the lack of velocity precision in pure smooth pursuit is due to the unavailability of position information. It is concluded that the smooth pursuit system is a sloppy velocity control system and that in normal tracking tasks the saccadic system, operating on position information, acts to improve the precision of the tracking response. S.D.

A79-25855 # Manual alignment of structural components in space. C. S. Major (MIT, Cambridge, Mass.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 15th, Washington, D.C., Feb. 6-8, 1979, Paper 79-0535.* 8 p. 8 refs.

An astronaut is assumed to spread his arms in order to reach for the ends of the structure members to be joined. The present experimental study pursues two objectives: (1) to determine in what manner a person will rotate an object with a large moment of inertia, and whether practice significantly improves the person's control; and (2) to relate the necessary joint strength between two long members to the manner in which a person assembles the joint. It is shown that subjects readily perceive errors of angular position but fail to recognize significant angular velocities. Therefore, strong joints requiring close alignment can be easily assembled, whereas weaker joints may fail when the connection is made in the presence of a high angular

velocity of the members. Subject performance shows little improvement with practice. S.D.

A79-25886 Naval aviation training - Perspective and prospects. J. Russ (U.S. Navy, Washington, D.C.). *Society of Automotive Engineers, Aerospace Meeting, San Diego, Calif., Nov. 27-30, 1978, Paper 781004.* 9 p.

The Naval pilot training program is reviewed, stressing the uniqueness of Naval flight due to the aircraft carrier environment. After a brief history of training practices, the various types of undergraduate and postgraduate programs open to present student pilots are outlined, noting the separate training pipelines for specialized missions and the use of obsolescent fleet aircraft as trainers. The evolutionary development of the Navy Integrated Flight Training System (NIFTS) is discussed and contrasted with the front end design technique now in favor, in which training and weapons systems are designed around the operator. Systems for training equipment procurement and pilot selection are discussed. Planned future systems include the Undergraduate Jet Pilot Training System (VTXTS), currently under development, and a training system for V/STOL aircraft. A.L.W.

A79-25887 Cost analysis of pilot training systems. H. F. Harris and H. E. Boren, Jr. (Northrop Corp., Los Angeles, Calif.). *Society of Automotive Engineers, Aerospace Meeting, San Diego, Calif., Nov. 27-30, 1978, Paper 781005.* 7 p.

This paper discusses the resources that must be considered when determining the costs of pilot training systems. Material presented here is based on the authors' experience in estimating the cost of current and advanced Pilot Training Systems. The paper examines how system requirements, such as number of students, attrition rates, course syllabi, and maintenance concepts impact training system personnel and equipment cost. The discussion also shows the sensitivity of pilot training cost to variations in training system requirements and hardware characteristics. (Author)

A79-25888 Recent studies of simulation training effectiveness. W. L. Waag (USAF, Human Resources Laboratory, Williams AFB, Ariz.). *Society of Automotive Engineers, Aerospace Meeting, San Diego, Calif., Nov. 27-30, 1978, Paper 781006.* 10 p.

Four studies investigating the effectiveness of flight simulation training are presented. They were selected on the basis that they illustrate the training effectiveness methodology currently employed, and that they demonstrate the potential value of simulation training. These four efforts address: (1) the training effectiveness of platform motion; (2) the relative effectiveness of alternate visual systems; (3) the effectiveness of generalized surface attack training; and, (4) the effectiveness of A-10 simulation training. These studies are discussed in terms of implications regarding required levels of fidelity as well as the potential value of the training. (Author)

A79-25889 Recent developments and plans for pilot training devices. D. Norman (U.S. Naval Training Equipment Center, Orlando, Fla.). *Society of Automotive Engineers, Aerospace Meeting, San Diego, Calif., Nov. 27-30, 1978, Paper 781007.* 4 p.

A system under development permitting increased opportunity for pilot refresher training is discussed. Low cost, necessary to wide availability, is achieved by using a general purpose minicomputer and a refresh, calligraphic display system with the various tasks depictable by changing software stored in a library of diskettes ('floppy disks'). The system is ready-room size, allowing thus for portability and compactness, and limits practice to one or a few elements of a mission such as night carrier landing, or various weapons delivery modes. Significant training may be accomplished on an individual, self-paced basis, with a comprehensive performance measurement system providing informative feedback to the user. It is expected that low cost and portability characteristics of the system will lead to wider availability of refresher training and consequent increases in readiness and safety. A.A.

A79-25890 Army Aviation Training - Research now and then. J. A. Bynum (U.S. Army, Research Institute, Fort Rucker, Ala.). *Society of Automotive Engineers, Aerospace Meeting, San Diego, Calif., Nov. 27-30, 1978, Paper 781008.* 7 p.

The U.S. Army's Aviation Training Research and Development Program is discussed in this paper. An overview of the research program concept is presented, with special emphasis on the behavioral research required to enhance aircrew performance. The overview is followed by discussions of representative research in the areas of tactical flight training, flight simulation, and aviator selection and assignment. The discussions emphasize the user orientation of the research and development and project the advanced techniques and trends in training and equipment. (Author)

A79-25891 Universal airborne approach to pilot performance assessment. J. C. Cotton (Canyon Research Group, Inc., Westlake Village, Calif.). *Society of Automotive Engineers, Aerospace Meeting, San Diego, Calif., Nov. 27-30, 1978, Paper 781009.* 19 p. 6 refs.

A program for developing an airborne performance assessment system, providing accurate, standardized, and observable information on pilot skill, and amenable to full scale production, is explored by considering previous flight training measurement research and development work sponsored by the U.S. Navy. The adjuncts to performance measurement regarded as practical and feasible were found to be performance diagnosis, adaptive advance and the incorporation of 'Training Central'. The first, provided to assist the instructor and/or pilot in improving flying habits, is a software function whose results can be read out in plain language on the pilot's APM control display unit. The second, predicated on the F14 simulator automated instructional support system, pertains to advancing a pilot through a specific flight curriculum, while the third involves the complementing of the airborne integral processing with an up/down data link which passes completed performance scores while a group of airplanes conduct training exercises. A.A.

A79-26007 Electromagnetic fields and power deposition in body-of-revolution models of man. T.-K. Wu (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-27, Mar. 1979, p. 279-283. 15 refs.

A surface integral equation (SIE) method involving integrals of induced currents on the interface between air and a biological body of revolution is developed to detect the so-called 'hot spots'. To test the validity of this method, SIE solutions for the interior fields and power absorption of a homogeneous lossy dielectric sphere are compared with exact solutions. Numerical results for the internal EM fields and power deposition in a body-of-revolution model of a human torso are given to determine the power dependence on the frequency and polarization of the incident plane wave and to detect the hot spots. S.D.

A79-26072 A binocular stereoscopic display system for echocardiography. H. Nakatani (Shizuoka University, Hamamatsu, Japan), S. Tamura, K. Tanaka (Osaka University, Toyonaka, Japan), A. Kitabatake, and M. Inoue (Osaka University Hospital, Osaka, Japan). *IEEE Transactions on Biomedical Engineering,* vol. BME-26, Feb. 1979, p. 65-68.

A three-dimensional echocardiographic imaging system based on the principle of binocular stereoscopy is described. The system automatically produces a three-dimensional image of the patient's heart from two-dimensional representations. i.e., tomograms. Binocular images of the heart chamber are generated on a CRT with plural boundary-lined tomograms. The boundary of the heart chamber is automatically specified from a tomogram by a minicomputer. As a clinical application, the proposed system has made it possible to observe spatial shapes of an atrial septal defect of the ostium secundum type. S.D.

A79-26073 The effects of filtering the His-Purkinje system electrocardiogram. E. J. Berbari (Iowa, University, Iowa City, Iowa),

R. Lazzara, and B. J. Scherlag (Oklahoma, University, Oklahoma City, Okla.). *IEEE Transactions on Biomedical Engineering,* vol. BME-26, Feb. 1979, p. 82-85. 17 refs.

The paper examines the applicability of the signal-averaging technique to record His-Purkinje system (HPS) potentials from the body surface of man as a means of noninvasive evaluation of intraventricular conduction using a 0.3-300 Hz recording bandwidth as opposed to the 80-300 Hz bandwidth most commonly used by other investigators. In particular, the bandpass filter is composed of two cascaded single-pole RC filters at both the high pass and low pass corner frequencies. Both the ECG with normal gain and the surface-averaged lead with high gain are input to the A/D converter of a minicomputer for averaging. The discussion concerns HPS waveforms obtained from eight normal subjects, six patients with complete RBBB, and six patients with complete LBBB. It is shown that the structures contributing to the HPS waveform are the His bundle, the proximal right bundle branch and the proximal left bundle branch. Digital filtering may prove to be a better method of waveform enhancement than analog filtering. S.D.

A79-26074 * Single frequency RF powered ECG telemetry system. W. H. Ko, J. Hynecek, and J. Homa (Case Western Reserve University, Cleveland, Ohio). *IEEE Transactions on Biomedical Engineering,* vol. BME-26, Feb. 1979, p. 105-109. 14 refs. Grants No. NGR-36-027-053; No. NIH-GM-14267.

It has been demonstrated that a radio frequency magnetic field can be used to power implanted electronic circuitry for short range telemetry to replace batteries. A substantial reduction in implanted volume can be achieved by using only one RF tank circuit for receiving the RF power and transmitting the telemetered information. A single channel telemetry system of this type, using time sharing techniques, was developed and employed to transmit the ECG signal from Rhesus monkeys in primate chairs. The signal from the implant is received during the period when the RF powering radiation is interrupted. The ECG signal is carried by 20-microsec pulse position modulated pulses, referred to the trailing edge of the RF powering pulse. Satisfactory results have been obtained with this single frequency system. The concept and the design presented may be useful for short-range long-term implant telemetry systems. (Author)

A79-26100 In vitro duplication of the primary light-induced charge separation in purple photosynthetic bacteria. M. J. Pellin, K. J. Kaufmann (Illinois, University, Urbana, Ill.), and M. R. Wasielewski (Argonne National Laboratory, Argonne, Ill.). *Nature,* vol. 278, Mar. 1, 1979, p. 54, 55. 15 refs. Research sponsored by the U.S. Department of Energy and NSF.

The primary light-induced electron transfer events of both green plant and bacterial photosynthesis result in very rapid charge separation which subsequently generates a chemical potential within the organism. Strong evidence favors a dimeric bacteriochlorophyll a (BChl a) structure for the primary photochemical electron donor. Covalently linked dimers of BChl a, chlorophyll a (Chl a) and pyrochlorophyll a (PChl a) have been prepared which mimic the spectroscopic and redox properties of reaction center chlorophylls. Because of its inherent stability towards photodegradation, the PChl a dimer was used to produce a functional model reaction center. The reported investigation made it possible to model successfully the primary light-induced charge separation chemistry in reaction centers of purple photosynthetic bacteria by using in vitro reaction center models based on chlorophyll derivatives. G.R.

A79-26140 * Effects of magnesium, calcium, and serum on reversion of stable L-forms. A. H. Horwitz and L. E. Casida, Jr. (Pennsylvania State University, University Park, Pa.). *Journal of Bacteriology,* vol. 136, Nov. 1978, p. 565-569. 10 refs. Grant No. NGR-39-009-180.

A79-26141 * Effects of low temperature on in vivo and in vitro protein synthesis in Escherichia coli and Pseudomonas fluorescens. R. J. Broeze, C. J. Solomon, and D. H. Pope (Rensselaer Polytechnic Institute, Troy, N.Y.). *Journal of Bacteriology,* vol. 134, June 1978, p. 861-874. 33 refs. Grant No. NsG-7345.

A79-26145 * The use of hybrid integrated circuit techniques in biotelemetry applications. T. B. Fryer (NASA, Ames Research Center, Moffett Field, Calif.). *Biotelemetry,* vol. 4, no. 4, 1977, p. 193-216. 9 refs.

A review is presented of some features of hybrid integrated circuits that make their use advantageous in miniature biotelemetry applications. The various techniques for fabricating resistors, capacitors and interconnections by both thin film and thick film technology are discussed. The use of chip capacitors, resistors, and especially standard IC chips on substrates with fired-on interconnection patterns is emphasized. The review is designed primarily to acquaint biotelemetry users and designers with an overview of this fabrication technique so that they can better communicate their needs with an understanding of its limitations and advantages to facilities specializing in hybrid construction. (Author)

A79-26146 * Use of platinum electrodes for the electrochemical detection of bacteria. J. R. Wilkins (NASA, Langley Research Center, Hampton, Va.). *Applied and Environmental Microbiology,* vol. 36, Nov. 1978, p. 683-687.

Platinum electrodes with surface area ratios of four to one were used to detect and enumerate a variety of gram-positive and gram-negative organisms. Linear relationships were established between inoculum size and detection time. End points for platinum electrodes were similar to those obtained with a platinum-reference electrode combination. Shape of the overall response curves and length of detection times for gram-positive organisms were markedly different than those for the majority of gram-negative species. Platinum electrodes are better than the platinum-reference electrode combination because of cost, ease of handling, and clearer definition of the end point. (Author)

A79-26147 * Thermal resistance of naturally occurring airborne bacterial spores. J. R. Puleo (California Institute of Technology, Jet Propulsion Laboratory, Planetary Quarantine Laboratory, Cape Canaveral, Fla.), S. L. Bergstrom, J. T. Peeler (Food and Drug Administration, Div. of Microbiology, Cincinnati, Ohio), and G. S. Oxborrow (Food and Drug Administration, Minneapolis, Minn.). *Applied and Environmental Microbiology,* vol. 36, Sept. 1978, p. 473-479. 26 refs. Contract No. NAS7-100.

Simulation of a heat process used in the terminal dry-heat decontamination of the Viking spacecraft is reported. Naturally occurring airborne bacterial spores were collected on Teflon ribbons in selected spacecraft assembly areas and subsequently subjected to dry heat. Thermal inactivation experiments were conducted at 105, 111.7, 120, 125, 130, and 135 C with a moisture level of 1.2 mg of water per liter. Heat survivors were recovered at temperatures of 135 C when a 30-h heating cycle was employed. Survivors were recovered from all cycles studied and randomly selected for identification. The naturally occurring spore population was reduced an average of 2.2 to 4.4 log cycles from 105 to 135 C. Heating cycles of 5 and 15 h at temperature were compared with the standard 30-h cycle at 111.7, 120, and 125 C. No significant differences in inactivation (alpha = 0.05) were observed between 111.7 and 120 C. The 30-h cycle differs from the 5- and 15-h cycles at 125 C. Thus, the heating cycle can be reduced if a small fraction (about 0.001 to 0.0001) of very resistant spores can be tolerated. (Author)

A79-26149 Digital man-machine control systems - The effects of preview lag. T. O. Kvalseth (Norges Tekniske Hogskole, Trondheim, Norway). *Ergonomics,* vol. 22, Jan. 1979, p. 3-9. 15 refs. Research supported by the Norges Teknisk-Naturvitenskapelige Forskningsrad and Royal Norwegian Navy.

Previous studies have clearly demonstrated the benefit of providing the human operator with input preview information during manual control tasks. This study was designed to analyze if and to what extent such preview benefit depends on whether the preview

extends immediately ahead of the 'present' position or is postponed (lagged) by a certain amount. The experimental results from eight subjects performing a purely digital pursuit control task with a first-order controlled system showed that the performance deteriorated (rms error increased) nearly linearly with increasing preview lag for a band-limited white Gaussian noise input. However, for a first-order autoregressive process (with parameter alpha = 0.9) as reference input, the control performance was clearly less affected by the preview lag. Irrespective of the extent of the preview lag, performance was clearly superior for alpha = 0.9 as compared to alpha = 0. (Author)

A79-26150 A theoretical model to estimate some ergonomic parameters from age, height and weight. A. Roozbazar, G. W. Bosker (Wichita State University, Wichita, Kan.), and M. E. Richerson. *Ergonomics,* vol. 22, Jan. 1979, p. 43-58. 25 refs.

The study develops and integrates a set of predictive equations to calculate some important anthropometric, biomechanical parameters pertaining to human performance. These equations are directly or indirectly related to age, height and weight. The study is concerned with the white male population. A computer program in FORTRAN is written to calculate the parameters from age, weight and height. Most of the equations are linear regression equations, and those with correlation coefficients less than 0.80 are omitted. Recommendations are made for the refinement and improvement of the described theoretical model to estimate ergonomic parameters from age, height and weight. S.D.

A79-26169 * Beta-galactosidase and selective neutrality. R. Holmquist (California, University, Berkeley, Calif.). *Science,* vol. 203, Mar. 9, 1979, p. 1012-1014. 14 refs. NSF Grant No. PCM-76-18627; Grant No. NGR-05-003-460.

Three hypotheses to explain the amino acid composition of proteins are inconsistent (about 10 to the minus 9th) with the experimental data for beta-galactosidase from Escherichia coli. The exceptional length of this protein, 1021 residues, permits rigorous tests of these hypotheses without complication from statistical artifacts. Either this protein is not at compositional equilibrium, which is unlikely from knowledge about other proteins, or the evolution of this protein and its coding gene have not been selectively neutral. However, the composition of approximately 60% of the molecule is consistent with either a selectively neutral or nonneutral evolutionary process. (Author)

A79-26240 Hyper-resolution in human perception of movement in visual displays. C. W. Tyler (Smith-Kettlewell Institute of Visual Sciences, San Francisco, Calif.). *SID, Proceedings,* vol. 19, 3rd Quarter, 1979, p. 121-125. 9 refs. Research supported by the Smith-Kettlewell Eye Research Foundation; Grants No. NIH-1-R01-EY02124; No. NIH-5-P30-EY01186.

The rates of information required for optimal graphic displays were measured by a psychophysical movement threshold technique. Measurements of sinusoidal movement sensitivity showed that for both simple and complex displays, sensitivity is maximal at about 2 Hz. In the fovea, movements of 10 arc sec are detectable, whereas at 20 deg in the retinal periphery, the sensitivity is poorer by at least a factor of ten. In contrast to available display capabilities, it appears that graphics display require effective bandwidths in the gigahertz range to test the limits of human performance. (Author)

A79-26344 # Space biology and medicine (Kosmicheskaia biologiia i meditsina). O. G. Gazenko and A. S. Ushakov. In: Soviet progress in space studies: The second decade of space flight, 1967-1977. Moscow, Izdatel'stvo Nauka, 1978, p. 487-524. 95 refs. In Russian.

Consideration is given to ecological physiology and the ecology of closed systems. Exobiology is reviewed and attention is given to biological experiments in space flight. Some medical problems associated with life support in space flight are discussed. B.J.

A79-26350 # Automatic control of physiological functions of the human organism in pathology (Avtomaticheskoe upravlenie fiziologicheskimi funktsiiami organizma v usloviiakh patologii). E. V. Maistrakh and Iu. S. Vail'. Leningrad, Izdatel'stvo Meditsina, 1978. 216 p. 283 refs. In Russian.

The paper discusses the automatic control of human physiological functions in pathology, with particular reference to the automated control of autonomic functions within the framework of cybernetics. The historical background of the problem is reviewed, and basic concepts of automatic control theory and methods of describing relevant devices are outlined. Main original automatic devices designed to control physiological systems such as circulation, external respiration, heat exchange, etc., are summarized. Attention is given to a discussion of general programming principles for automatic control systems and their technological realization. On the pathophysiological level, the problem of interaction between the automatic control system and the living organism is examined from the standpoint of deterministic and probabilistic relationships in the 'automaton-organism' system. S.D.

A79-26356 The human operator in the control system: Linear models (Der Mensch im Regelkreis: Lineare Modelle). G. Johannsen, H. E. Boller, E. Donges, and W. Stein (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). Munich, R. Oldenbourg Verlag GmbH, 1977. 258 p. 171 refs. In German. $19.

A description of human control behavior by means of nonparametric procedures is considered, taking into account cases of manual control, the determination of the frequency characteristics of the human controller, the determination of the residual quantity of the human controller, a compilation of characteristic quantities and functions for the description of manual control processes, and results related to the control behavior of the human operator. Parametric, quasi-linear models for the human controller are discussed along with extensions of the quasi-linear models, and a precision model which takes into consideration the physiological background of sensomotoric processes. A linear model for human control behavior on the basis of optimal control and evaluation theory is also examined. G.R.

A79-26373 * A biogeochemical study of the Abu Dhabi algal mats - A simplified ecosystem. J. N. Cardoso, C. D. Watts, J. R. Maxwell, R. Goodfellow, G. Eglinton (Bristol, University, Bristol, England), and S. Golubic (Boston University, Boston, Mass.). *Chemical Geology,* vol. 23, 1978, p. 273-291. 65 refs. Research supported by the Nuffield Foundation and American Chemical Society; Natural Environment Research Council Grant No. GR/3/2420; NSF Grant No. GA-43391; Grant No. NGL-05-003-003.

A79-26450 # Elements of the theory of biological analyzers (Elementy teorii biologicheskikh analizatorov). N. V. Pozin, I. A. Liubinskii, O. V. Levashov, G. A. Sharaev, L. A. Shmelev, and V. P. Iakhno. Moscow, Izdatel'stvo Nauka, 1978. 360 p. 465 refs. In Russian.

The present three-part work is concerned with the model representation of the principles of information processing as related to the nervous system in animals and in man. The development of the models combines neurophysiological data with the formulation of informational transformations in the context of cybernetics. Part I discusses informational processes in the neuron. Attention is given to recent results on the active role of dendrites of varying configuration. Part II deals with the auditory system. Emphasis is placed on the mechanisms of frequency analysis, binaural hearing, and perception of the pitch and rhythmicity of acoustic signals. Part III examines the visual system, with particular reference to the concepts of space-frequency analysis of images, to texture differentiation, and to binocular fusion. S.D.

A79-26499 # Psychologists vs engineers. D. D. Fulgham (USAF, Washington, D.C.). In: Extending the scope of flight simula-

tion; Proceedings of the Fourth Symposium, London, England, April 19, 1978. Symposium sponsored by the Royal Aeronautical Society. London, Royal Aeronautical Society, 1978. 9 p.

An operational command which submits a new training requirement to the research and development community will frequently require that a level of fidelity be specified for the device, whether it be a visual system, motion system, or cockpit. Historically the engineer has provided fidelity as near the real world as economically feasible, while the psychologist accuses him of designing beyond the requirements for training. The engineer, in turn, has declared that the psychologist is too late with too little. The present paper deals with 'windows of opportunity' that exist for the psychologist to provide useful data during the development, acquisition, and utilization stages of training devices. V.P.

A79-26500 # **Cyclic nucleotides and adaptation of the organism (Tsiklicheskie nukleotidy i adaptatsiia organizma).** G. I. Dorofeev, L. A. Kozhemiakin, and V. T. Ivashkin. Leningrad, Izdatel'stvo Nauka, 1978. 184 p. 935 refs. In Russian.

The work presents current concepts on the role and biological significance of cyclic nucleotides in the regulation of cellular metabolism as well as in the maintenance and mediation of the functional activity of organs and physiological systems. The diverse effects of cyclic AMP and cyclic GMP (G = quanasine) are considered to demonstrate the participation of cyclic nucleotides in the pathogenesis of myocardial ischemia, bronchial asthma, gastrointestinal diseases, and certain endocrinopathies and extremal conditions. The discussion stresses the importance of changes in the character and dynamics of cyclic AMP-GMP relationship in organs and tissues for generation of adaptive processes and controlled effect on the resistance of the organism to extremal environmental factors. S.D.

A79-26542 **HCN did not condense to give heteropolypeptides on the primitive earth.** J. P. Ferris (Rensselaer Polytechnic Institute, Troy, N.Y.) and C. N. Matthews (Illinois, University, Chicago, Ill.). *Science,* vol. 203, Mar. 16, 1979, p. 1135-1137. 41 refs.

Matthews et al. (1975, 1977) have proposed that heteropolypeptides are formed directly by gas-phase condensation of HCN dimers and that these polypeptides were formed on the primitive earth as well as in such extraterrestrial environments as the moon and Jupiter. The present paper cites experimental evidence which indicates that, while HCN was probably a likely source of amino acids and other biomolecules on the primitive earth and possibly in some extraterrestrial environments, the postulate that heteropolypeptides are formed by gas-phase condensation of HCN dimers is untenable. In reply, Matthews argues that the research of Ferris et al. is too narrowly restricted to aqueous cyanide chemistry to have much bearing on the issues involved. He cites (admittedly ambiguous) experimental results that suggest that crude polymers with some peptide character are readily formed from HCN reactions over a wide range of physical conditions, including those prevailing in carbonaceous chondrites and perhaps on the moon. F.G.M.

A79-26584 * **Weight control and restraint of laboratory rats.** C. J. Hilado and K. Van Breda Kolff (San Francisco, University, San Francisco, Calif.). *Journal of Combustion Toxicology,* vol. 6, Feb. 1979, p. 58-62. 14 refs. Grant No. NsG-2039.

The use of restrained and confined rats in some procedures used in combustion toxicology introduces the problems of obtaining rats of the appropriate size for the apparatus, and of identifying any artifacts resulting from the use of restraint alone. Feeding studies indicate that controlled feeding of fast-growing strains such as the Sprague-Dawley can hold rat size essentially constant for significant periods of time. The undesirable aspects are the need to cage the animals individually, with resultant psychological as well as metabolic effects. Restraint studies of slow-growing strains such as the Fischer 344 indicate that denying access to food and water for periods of several hours at a time interrupts normal gain only temporarily. (Author)

A79-27101 **Thermoregulation in Macaca mulatta - A thermal balance study.** G. S. Johnson and R. S. Elizondo (Indiana University, Bloomington, Ind.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Feb. 1979, p. 268-277. 23 refs. Grants No. AF-AFOSR-73-2473; No. PHS-AM-16703.

A complete thermal balance study is performed on four unanesthetized nonheat-acclimated male rhesus monkeys (M. mulatta) weighing 3.1-5.5 kg. Emphasis is placed on evaluating the relative significance of evaporative heat losses due to whole-body eccrine sweating and respiratory evaporative water loss, and on elucidating the physiological mechanisms responsible for the control of both evaporative heat loss due to eccrine sweating and metabolic heat production in this species of primate. The results indicate that (1) eccrine sweating serves as the major source of evaporative heat loss in M. mulatta above the upper critical ambient temperature (30.6 C); (2) within the thermal neutral zone (24.7-30.6 C), thermal balance is maintained by vasomotor control; and (3) below the lower critical ambient temperature, thermal balance is maintained by an increase in metabolic rate, attributable to shivering thermogenesis. S.D.

A79-27102 **Hemodynamics in teenagers and asthmatic children during exercise.** M. Friedman, K. L. Kovitz, S. D. Miller, M. Marks, and M. A. Sackner (Dundee, University, Dundee. Scotland). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Feb. 1979, p. 288-292. 23 refs.

Ten to fifteen healthy subjects (18-30 yr) are tested to assess the correlation between cardiovascular variables and different magnitudes of passive body tilt. Also assessed is the relative response of the vascular bed in the finger to passive body tilts. It is inferred from the results obtained that, under certain circumstances, the forearm and finger blood flow responses to the same physiological stimulus may be different, depending on the magnitudes and durations of the reflex mechanisms affecting the two vascular beds. S.D.

A79-27103 **Effects of ozone inhalation on work performance and maximal oxygen uptake.** W. M. Savin and W. C. Adams (California, University, Davis, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Feb. 1979, p. 309-314. 30 refs. Grant No. AF-AFOSR-77-3153.

Nine subjects are tested to assess the effects of O3 (0.15, 0.30 ppm) inhalation during graded bicyle exercise to volitional fatigue on work capacity and maximal oxygen uptake. It is found that O3 exposure has no significant effect on maximal work rate, anaerobic threshold, or any pulmonary function parameter. The results indicate that exercise ventilation during maximal work is a sensitive indicator of the effects of O3 exposure. It is concluded that exposure of healthy young men to as much as 0.30 ppm O3 for no more than 30 min of progressively incremented exercise to volitional fatigue is not sufficient to cause a significant decrease in work capacity or maximal oxygen uptake. S.D.

A79-27104 **CO2 and exercise tidal volume.** B. J. Martin and J. V. Weil (Colorado, University, Medical Center, Denver, Colo.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Feb. 1979, p. 322-325. 21 refs. Grant No. NIH-HL-14985.

Graded bicycle-ergometer exercise tests are performed on 13 subjects, with reference to determination of anaerobic threshold, prevention of hypocapnia during severe exercise, elevation of alveolar oxygen tension during exercise, and infusion of buffered lactate. It is found that CO2 addition to prevent alveolar hypocapnia during exercise progressing to exhaustion in 12-15 min significantly elevates the tidal-volume plateau; this tidal-volume increase is mediated by a substantial increase in inspiratory time. The results suggest that hypocapnia in severe exercise measurably lowers the tidal-volume plateau in normal man. S.D.

A79-27105 **Acid-base curve nomogram for chimpanzee blood and comparison with human blood characteristics.** N. Takano, M. J. Lever, and C. J. Lambertsen (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology: Respiratory,*

Environmental and Exercise Physiology, vol. 46, Feb. 1979, p. 381-386. 17 refs. Contracts No. F29600-69-C-0010; No. N00014-67-A-0216-0026; Grant No. NIH-HL-08899.

The paper describes a study designed to give a full description of the acid-base system of the chimpanzee by constructing nomogram based on that designed by Siggaard-Andersen (1960, 1962, 1974) for man. In addition, because it is important to demonstrate whether differences exist between the blood of chimpanzees and that of humans, an equivalent nomogram is constructed using blood from normal young human subjects which was subjected to exactly the same experimental techniques as used for the chimpanzee blood. It is found that the P(CO2)-pH-base excess nomogram for the chimpanzee blood deviates slightly from that for the human blood, most probably due to an arterial bicarbonate concentration in the chimpanzee slightly higher than that in man. S.D.

A79-27118 # Effects of dietary composition on nutritional state in rats during exposure to high altitude. H. Osada, I. Sakurai, T. Sakaguchi, E. Sakaguchi, and R. Yurugi (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 19, Sept. 1978, p. 45-56. 10 refs. In Japanese, with abstract in English.

Wister rats were fed on four kinds of diets - ordinary stock diet (group N), high carbohydrate diet (group C), high protein diet (group P), and high fat diet (group F) - and were exposed to a simulated altitude of 5500 m in a low pressure chamber. It was found that food intake of all groups dropped to near zero in the initial stage of the exposure and reached a level of about 70% of the preexposure value by the 10th day of exposure. Body weight also decreased in response to the change in food intake. Animals in group N exhibited the least changes in body weight. Hb and Ht values increased gradually and steadily during the exposure in all groups, with little difference between groups. Blood sugar, plasma protein, and plasma lipids components showed no certain trend within and among the groups. The results indicate that chronic altitude exposure may affect intricate intermediate metabolism of nutrients. P.T.H.

A79-27119 # A study of progress in flying performance revealed from daily check sheets in a primary flight training course. III - Comparison of progress between two courses. M. Okaue and K. Niwa (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 19, Sept. 1978, p. 57-66. 6 refs. In Japanese, with abstract in English.

A79-27120 # Transient changes in arterial blood gases and heart rate during and after acutely induced hypoxia and hyperoxia to rabbits. C. Mizumoto and N. Nitami (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 19, Sept. 1978, p. 67-73. 13 refs. In Japanese, with abstract in English.

A79-27226 * Senescent changes in the ribosomes of animal cells in vivo and in vitro. J. Miquel (NASA, Ames Research Center, Moffett Field, Calif.) and J. E. Johnson, Jr. (National Institutes of Health, National Institute on Aging; Baltimore City Hospital, Baltimore, Md.). *Mechanisms of Ageing and Development,* vol. 9, 1979, p. 247-266. 106 refs.

The paper examines RNA-ribosomal changes observed in protozoa and fixed postmitotic cells, as well as the characteristics of intermitotic cells. Attention is given to a discussion of the implications of the reported ribosomal changes as to the senescent deterioration of protein synthesis and physiological functions. A survey of the literature suggests that, while the data on ribosomal change in dividing cells both in vivo and in vitro are inconclusive, there is strong histological and biochemical evidence in favor of some degree of quantitative ribosomal loss in fixed postmitotic cells. Since these decreases in ribosomes are demonstrated in differential cells from nematodes, insects and mammals, they may represent a universal manifestation of cytoplasmic senescence in certain types of fixed postmitotic animal cells. The observed variability in ribosomal loss for cells belonging to the same type suggests that this involution phenomenon is rather related to the wear and tear suffered by a particular cell. S.D.

A79-27239 * Effect of ultrasonic irradiation on mammalian cells and chromosomes in vitro. J. A. Roseboro (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), P. Buchanan (North Carolina, University, Chapel Hill, N.C.), A. Norman, and R. Stern (California, University, Los Angeles, Calif.). *Physics in Medicine and Biology,* vol. 23, no. 2, 1978, p. 324-331. 8 refs. Research supported by the North Carolina State Board of Health and University of North Carolina.

Human peripheral blood and HeLa cells were irradiated in vitro at the ultrasonic frequency of 65 kHz. The whole blood and HeLa cell suspensions were exposed to continuous and pulsed ultrasonic power levels of 0.12, 0.16, 0.72, 1.12 and 2.24 W for a period of one minute. The method of ultrasonic irradiation was carried out with the whole blood or HeLa cell suspensions coupled directly to a cylindrical transducer while heating of the cell suspensions in excess of 41 C was avoided. Irradiated and unirradiated peripheral blood lymphocyte chromosome cultures were prepared and scored for selected numerical and morphological aberrations. There was no significant difference in the frequency of chromosomal aberrations between irradiated and unirradiated cells. (Author)

A79-27298 Physiological aspects of flight. R. J. Del Vecchio (Grumman Aerospace Corp., Bethpage; Dowling College, Oakdale, N.Y.). Oakdale, N.Y., Dowling College Press, 1977. 166 p. $10.00.

The present textbook is a study reference for the physiological aspects of flight under conditions where aircraft operate at speeds much greater than that of sound, climb at rapid rates, and fly effectively well above 50,000 ft. These flight conditions introduce a number of changes from an environment on earth to one above earth, including extreme variations in temperature, extensive and sudden changes in pressure, and movement effects at high speeds. Topics of interest include altitude dysbarism, cabin pressurization and rapid decompression, sensory illusions of flight, fatigue, body heat balance, and hypoglycemia. A glossary of terms and several relevant experimental methods and materials are included. S.D.

A79-27303 # Control systems for robots and manipulators (Sistemy upravleniia manipuliatsionnykh robotov). V. S. Medvedev, A. G. Leskov, and A. S. Iushchenko. Moscow, Izdatel'stvo Nauka, 1978. 416 p. 116 refs. In Russian.

A hierarchic approach is taken to the design of control systems for robots and manipulators and consideration is given to automatic, bioengineering, and interactive systems of manipulator control. A computational procedure for describing the dynamic characteristics of the functional systems of robots and manipulators is developed along with algorithms of digital simulation of manipulator motions. Consideration is given to algorithms for the semiautomatic control of manipulators, and problems of the stability and synthesis of robots and manipulators are addressed. B.J.

A79-27335 # The origin of life on earth - Recent studies (Nachalo zhizni na zemle - Novye issledovaniia). S. Fox (Miami, University, Coral Gables, Fla.). In: Science and mankind: International annual. Moscow, Izdatel'stvo Znanie, 1978, p. 159-169. In Russian. (Translation).

The paper gives an overview of analytic laboratory results and space observational data that pertain to the question of the origin of life. A small fraction of Apollo-14 soil was converted to amino acids in reaction with acidified hot water, and no evidence was found that the amino acids came from outside the soil. Experiments have shown that amino acids are capable of forming protein-like polymers, called proto-proteins, which can in turn form protocells. Some of the properties of protein-like microspheres studied under high magnification are discussed. A scheme for the evolution of the cell along a path beginning with amino acid precursors is proposed. P.T.H.

A79-27552 **Visual-vestibular interactions. I - Influence of peripheral vision on suppression of the vestibulo-ocular reflex and visual acuity.** F. E. Guedry, Jr., J. M. Lentz (U.S. Navy, Aerospace Medical Research Laboratory, Pensacola, Fla.), and R. M. Jell (U.S. Navy, Aerospace Medical Research Laboratory, Pensacola, Fla.; Manitoba, University, Winnipeg, Canada). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 205-211. 24 refs.

Legibility of head-fixed displays in some motion environments is partially dependent upon visual suppression of the vestibuloocular reflex (VOR). This study investigates the effects of differing relationships between peripheral background movement and whole-body motion on the VOR and on visual performance. The purpose of the study is to explore factors in motion environments that influence performance limits and to develop procedures of potential usefulness in evaluating interacting visual and vestibular function. Visual performance and visual suppression of the VOR were markedly different, depending upon the relative direction of peripheral background movement. Visual suppression of the VOR, and visual performance, were disrupted far more when vestibular inputs and peripheral optokinetic inputs were discordant than when they were concordant. Results have potential implications for head-up displays and suggest a procedure for evaluating visual/vestibular function. (Author)

A79-27553 * **RBC-/Cr-51/ half-life and albumin turnover in growing Beagle dogs during chronic radial acceleration.** D. A. Beckman, J. W. Evans (California, University, Davis, Calif.), and J. Oyama (NASA, Ames Research Center, Biomedical Research Div., Moffett Field; California, University, Davis, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 212-217. 30 refs. Grant No. NCA2-OR180-505.

The effects of chronic centrifugation on growing Beagle dogs exposed to -2 or -2.6 Gx on albumin and RBC turnover rates, albumin concentration and space, and total blood volume were determined and compared with caged and run control of animals. Albumin-(I-125) and autologous RBC-(Cr-51) preparations were injected into all dogs at day 82 of the centrifugation periods, and the disappearance curves were determined by successive bleedings of the animals over the next 35 d, during which the centrifugation was continued. There were no differences in albumin turnover rates or space. Two populations of RBCs were found in both centrifugated groups, one with a normal half-life of 27 + or - 1 S.E.M. d, and one with a significantly (p less than 0.01) shorter half-life of 15 + or - 2 S.E.M. d. An absolute polycythemia was also observed in both centrifuged groups. The results suggest that chronic centrifugation acts through some as-yet unknown mechanism to affect RBC population kinetics. (Author)

A79-27554 **Systolic time intervals during combined hand cooling and head-up tilt.** M. A. B. Frey and R. A. Kenney (George Washington University, Washington, D.C.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 218-222. 22 refs.

Cardiac effects initiated by hand cooling and head-up tilt, separately and in combination, were studied in human subjects. Systolic and diastolic arterial pressures, heart rate, pre-ejection period (PEP), and left ventricular ejection time (LVET) were measured while subjects were resting supine, supine with hand immersed in 10-C water tilted 70 deg head up, and hand immersed during head-up tilt. Hand immersed and head-up tilt individually increased diastolic blood pressure and concomitantly increased the duration of PEP. During the combined maneuver, the increase in diastolic pressure was greater than observed during either separate maneuver; however, the combined maneuver had no comparable summative effect on PEP prolongation. An interaction appears to occur during the combined maneuver which counteracts the Frank/Starling effect on PEP due to decreased venous return during head-up tilt. (Author)

A79-27555 **Laser eye protection for flight personnel.** G. T. Chisum (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 239-242.

Recent developments in laser technology have resulted in an increase in the utilization of laser devices for military applications, both in research and in field use. The increased use of these systems increases the probability of exposure of flight personnel to injurious effects of the laser radiation. Experimental laser effects data have been used to obtain maximum-permissible-exposure level standards, determine the distances at which MPE levels will be reached, and determine the extent of the protection required to reduce the exposure levels to the MPE for personnel who must operate inside the safe separation distances. The analyses presented are limited to high-power lasers in the visible (400-700 nm) and the near-infrared (700-1400 nm) regions, in relation to eye damage hazards from laser exposures. Several types of eye protection from laser radiation are examined. A helmet visor lens, which provides adequate absorption for the specified wavelength, is considered most suitable for flight personnel. S.D.

A79-27556 **Aeromedical implications of the X-Chrom lens for improving color vision deficiencies.** K. W. Welsh, J. A. Vaughan, and P. G. Rasmussen (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 249-255. 14 refs.

A red contact lens (X-Chrom lens) worn on the nondominant eye by 12 color-defective subjects caused significant improvements on the Dvorine, Ishihara, and Hardy-Rand-Rittler pseudo-isochromatic color plate tests. Color vision scores on the Farnsworth Lantern, Color Threshold Tester, and Aviation Signal Light Gun were not improved. Minimal changes were found on the Farnsworth D-15 test, aeronautical chart color identification task, visual acuity, phoria, and stereoscopic depth perception. Control and color-defective subjects perceived a change in the path of a pendulum (Pulfrich test) when viewing through the X-Chrom lens or a monocular red filter. The X-Chrom lens may require extended wearing before its optimum effect becomes apparent. (Author)

A79-27557 **Organ blood flow, cardiac output, arterial blood pressure, and vascular resistance in rats exposed to various oxygen pressures.** D. Torbati, D. Parolla, and S. Lavy (Jerusalem, Hebrew University, Jerusalem, Israel). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 256-263. 37 refs.

A79-27558 * **Optokinetic motion sickness - Attenuation of visually-induced apparent self-rotation by passive head movements.** R. A. Teixeira (Brandeis University, Waltham, Mass.) and J. R. Lackner (Brandeis University, Waltham; MIT, Cambridge, Mass.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 264-266. 20 refs. Contract No. NAS9-15147.

An experimental study was conducted on seven normal subjects to evaluate the effectiveness of passive head movements in suppressing the optokinetically-induced illusory self-rotation. Visual simulation was provided by a servo-controlled optokinetic drum. Each subject participated in two experimental sessions. In one condition, the subject's head remained stationary while he gazed passively at a moving stripe pattern. In the other, he gazed passively and relaxed his neck muscles while his head was rotated from side to side. It appears that suppression of optokinetically-induced illusory self-rotation with passive head movements results from the operation of a spatial constancy mechanism interrelating visual, vestibular, and kinesthetic information on ongoing body orientation. The results support the view that optokinetic 'motion sickness' is related, at least in part, to an oculomotor disturbance rather than a visually triggered disturbance of specifically vestibular etiology. S.D.

A79-27559 **Head acceleration and psychomotor performance.** D. C. Reader (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 267-270. 13 refs.

An experimental study on subjects exposed to gradually increasing impact forces (0, 5, 10 and 12 -Gx facing forward) is conducted in order to determine whether head acceleration can produce a syndrome in man similar to that observed in experimental concussion in animals. The study is carried out on a decelerator using a tracking task to assess whether high head acceleration can affect psychomotor performance. EEGs are also recorded. It is found that both the linear and angular accelerations at the head are increased at the higher levels of impact acceleration. Psychomotor task data demonstrate that deceleration can impair performance immediately following impact, but that performance recovers within a few minutes. Below -10 Gx no significant performance deficit is observed. S.D.

A79-27560 Age trends in the cardiovascular dynamics of aircrewmen. W. K. Harrison (California, University, San Diego, Calif.) and J. E. Smith (United Air Lines, Inc., Medical Dept., Washington, D.C.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 271-274. Grant No. NIH-20373.

Age trends in the cardiovascular dynamics of 51 aircrewmen were investigated by means of noninvasive techniques. A statistically significant (p less than 0.01) decline in the ability of their hearts to accelerate blood was found to accompany advancing age. This trend was stronger than the rise in blood pressure found in the group, and known to occur in all aging populations. Assessment of cardiovascular aging in this way may provide new information necessary for the revision of the present mandatory retirement age for airline pilots. (Author)

A79-27561 Current role of alcohol as a factor in civil aircraft accidents. L. C. Ryan (FAA, Office of Aviation Medicine, Washington, D.C.) and S. R. Mohler (Wright State University, Dayton, Ohio). *(Aerospace Medical Association, Annual Meeting, New Orleans, La., May 8-11, 1978.) Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 275-279. 11 refs.

Ethyl alcohol continues as a serious adverse factor in general aviation flight safety. According to FAA figures, the level of alcohol-associated general aviation fatal accidents has remained relatively static at a 16% general level since 1969. A recent survey of the attitudes of pilots toward alcohol and flying reveals a lack of appreciation among one-third of the pilots concerning the adverse effects of alcohol on safe flight. A renewed pilot education program on alcohol and flight safety appears indicated. (Author)

A79-27562 Aeromedical aspects of otolaryngology. H. H. Hanna (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 50, Mar. 1979, p. 280-283. 6 refs.

Man is a terrestrial creature with sense organs well suited for surface living. However, when he ventures above the earth's surface he may encounter hazardous conditions. The discussion focuses on ENT (Ear, Nose, Throat) conditions most directly related to flight operations. These are motion sickness, spatial disorientation, barotrauma, noise-induced hearing loss, and certain clinical problems that may produce sudden incapacitation (vertigo, poststapedectomy state). S.D.

A79-27673 Recognition by the human eye of colored symbols on different backgrounds (Reconnaissance par l'ceil humain de symboles colorés sur différents fonds). G. Santucci (Centre de Recherches de Médecine Aéronautique, Paris, France). *(Colloque sur l'Intégration des Systèmes, Paris, France, Feb. 10, 11, 1977.) Sciences et Techniques de l'Armement (Mémorial de l'Artillerie Française),* vol. 52, no. 4, 1978, p. 629-638. 5 refs. In French.

A novel apparatus is used to study the angular visual acuity in far vision simultaneously with an evaluation of color contrast sensitivity on a CRT. The study is conducted on a 20-50-year-old population without any ophtalmological symptoms. Significant differences are found in the acuity threshold depending on the color couples composed by the combination of red, green, blue, white, yellow and black. S.D.

A79-27928 * The response of selected terrestrial organisms to the Martian environment - A modeling study. W. R. Kuhn (Michigan, University, Ann Arbor, Mich.), S. R. Rogers (Sloan-Kettering Institute for Cancer Research, New York, N.Y.), and R. D. MacElroy (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, Calif.). *Icarus,* vol. 37, Jan. 1979, p. 336-346. 22 refs. NASA Order A-17362-B.

An energy balance model has been developed to investigate how the Martian atmospheric environment could influence a community of photosynthetic microorganisms with properties similar to those of a cyanophyte (blue-green algal mat) and a lichen. Surface moisture and soil nutrients are assumed to be available. The model was developed to approximate equatorial equinox conditions and includes parameters for solar and thermal radiation, convective and conductive energy transport, and evaporative cooling. Calculations include the diurnal variation of organism temperature and transpiration and photosynthetic rates. The influences of different wind speeds and organism size and resistivity are also studied. The temperature of organisms in mats less than a few millimeters thick will not differ from the ground temperature by more than 10 K. Water loss is actually retarded at higher wind speeds, since the organism temperature is lowered, thus reducing the saturation vapor pressure. Typical photosynthetic rates lead to the production of 1 millionth to 100 billionths mole O2 per sq cm/day. (Author)

A79-27929 Chemical fingerprints of life in terrestrial soils and their possible use for the detection of life on Mars and other planets. A. Banin and J. Navrot (Jerusalem, Hebrew University, Rehovot, Israel). *Icarus,* vol. 37, Jan. 1979, p. 347-350. 12 refs.

Organic carbon in oxidizable forms and nitrogen are the only elements among some 40 elements studied that are significantly enriched in terrestrial soils as compared to the crust. This enrichment is due to and reflecting life activity in soils, and is characterized by a unique profile distribution. It is suggested that these facts can constitute the basis for the future chemical-biological search for life in planetary soils. (Author)

A79-27930 Habitable zones about main sequence stars. M. H. Hart (Systems and Applied Sciences Corp., Riverdale, Md.). *Icarus,* vol. 37, Jan. 1979, p. 351-357. 13 refs.

Calculations show that a main-sequence star less massive than the sun has a continuously habitable zone about it which is not only closer in than the corresponding zone about the sun, but is also relatively narrower. Let L(t) represent the luminosity after t billion years of a main-sequence star of mass M, and let r(inner) and r(outer) represent the boundaries of the continuously habitable zone about such a star; that is, the zone in which an earthlike planet will undergo neither a runaway greenhouse effect in the early stages of its history nor runaway glaciation after it develops an oxidizing atmosphere. Then the computer results indicate that r(outer)/r(inner) is roughly proportional to the square root of L(3.5)/L(1.0). This ratio is smaller for stars less massive than the sun (because they evolve more slowly), and the width of the continuously habitable zone about a main-sequence star is therefore a strong function of the initial stellar mass. The calculations show that r(inner) equals to r(outer) for a mass of about 0.83 solar mass (i.e., K1 stars), and it therefore appears that there is no continuously habitable zone about most K stars, nor any about M stars. (Author)

A79-27959 Electromagnetic power absorption in cylindrical tissue models excited by a loop antenna. T. Yoneyama, T. Suzuki, and S. Nishida (Tohoku University, Sendai, Japan). *Electronics Letters,* vol. 15, Feb. 15, 1979, p. 125-127. 6 refs.

A79-28013 Digital color image compression in a perceptual space. C. F. Hall and H. C. Andrews (Southern California, University, Los Angeles, Calif.). In: Applications of digital image processing; Proceedings of the Seminar, San Diego, Calif., August 28, 29, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 182-188. 15 refs. Contract No. F33615-77-C-1016.

A nonlinear mathematical model for the human visual system (HVS) is selected as a preprocessing stage for monochrome and color digital image compression. Rate distortion curves and derived power spectra are used to develop coding algorithms in the preprocessed 'perceptual space'. Black and white image compressions down to .1 bit per pixel are obtained. In addition, color images are compressed to 1 bit per pixel (1/3 bit per pixel per color) with less than 1% mean square error and no visible degradations. Minor distortions are incurred with compressions down to 1/4 bit per pixel (1/12 bit per pixel per color). Thus, it appears that the perceptual power spectrum coding technique 'puts' the noise where one can not see it. The result is bit rates up to an order of magnitude lower than those previously obtained with comparable quality. (Author)

A79-28156 Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Seminar sponsored by the Society of Photo-Optical Instrumentation Engineers. Edited by L. Beiser. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 162), 1978. 174 p. $36.

The papers deal with the areas of image realism, human factors, visual simulation techniques, computer-generated imagery, and novel display techniques. The broad spectrum of technology and discipline covered is helpful in revealing the latest development in hardware and the factors which lead to the development of more effective systems. V.P.

A79-28157 Object, illusion and frame of reference as design criteria for computer-generated displays. M. L. Ritchie (Wright State University, Dayton, Ohio). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 8-10.

For purposes of commercial television, there seems to be little to do now but pay the cost of handling that much information. The general purpose of television is to reproduce for the observer what the camera sees. The observer may decide for himself what information in the scene he wants to see, and how he wants to use it. For the purposes of computer-generated displays, the situation is markedly different. There is no camera, and there is no scene to be reproduced. The system designer has almost complete freedom about what the scene, he synthesizes, will contain. Also, he can know what the task of the observer will be and know, therefore, what use he will be making of the transmitted information. At the upper limit of his options, the designer of a computer-generated display system can produce a scene with 10 to the seventh bytes per second that would look as coming from a TV camera. In the present paper, it is shown that large gains in efficient design of picture-drawing systems are possible through joint use of knowledge of perceptual habits and operator task analyses. V.P.

A79-28158 Digital image anomalies - Static and dynamic. N. S. Szabo (Singer Co., Link Div., Sunnyvale, Calif.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 11-15.

Digitally generated images have a number of anomalies which are frequently referred to as rastering and aliasing. These effects are due to sampling in both the spatial and time domains. Algorithms for suppressing these effects are currently known. The challenge is now to find economical solutions, since the mathematically exact algorithms are prohibitively expensive. The search for these solutions must be based on a better understanding of human perception because the ultimate judge in the acceptability of an image is the observer. Any deviations from the mathematically exact solution must be based on experiments and perception. V.P.

A79-28162 Visual system for the Boom Operator Part Task Trainer. R. B. Ewart (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 43-50.

The Boom Operator Part Task Trainer (BOPTT) described in the present paper is intended to teach the aerial refueling task to KC-135 boom operators. The visual system of the BOPTT provides accurate visual cues to the trainee. Its field of view is nearly that of the aircraft. The boom operator sees the refueling boom, the receiver aircraft image, and the background terrain through the rear window of the KC-135. All these images appear at their correct distances with true parallax between the image planes. V.P.

A79-28163 Component performance of a 360 deg non-programmed visual display. F. J. Oharek and J. F. Harvey (U.S. Navy, Naval Training Equipment Center, Orlando, Fla.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 51-56.

In the training system described in the present paper, the display area is a 3-meter-radius spherical screen with a laser display coverage of 360 deg horizontally and 60 deg vertically. The display pickup is a probe over a model board. The image transfer system from the probe to the projection lens makes use of 12 linear charge-coupled device arrays, each of which is a channel of video data. The visual scene, generated by the trainee himself (non-programmed), is free of color, edge, or brightness matching that arise in multiple discrete channel display systems. The design, manufacture, and testing of the major subsystems are discussed, with emphasis on the laser scanner, the prism rotators, the projection lens, and the electronic synchronization of the system. V.P.

A79-28164 A 25-inch precision color display for simulator visual systems. R. E. Holmes and J. A. Mays (Systems Research Laboratories, Inc., Dayton, Ohio). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 57-62.

This paper describes the development of a high-resolution 25-in. color display for simulator visual systems. One of the unique features of the display is the incorporation of a microprocessor-based digital convergence system capable of achieving absolute convergence at 256 points. This system permits the operator to adjust convergence, geometry, size, position, brightness, and contrast of the display through the simulator optics system by means of a remote-control unit. This feature can be used to correct for color aberrations of the optics as well as the normal misregistration (misconvergence) associated with color cathode ray tubes (CRTs). Linear feedback amplifiers are used in the display to achieve superior long-term convergence stability. The control functions available include not only the normal red, green, and blue adjustments but also dynamic blue-lateral control. These unique design features greatly simplify the convergence- and geometry-correction process; and, as a result, a relatively unskilled operator can accomplish precision registration of a simulator visual system, even with a matrix of color displays. (Author)

A79-28165 Windshield quality and pilot performance measurement utilizing computer-generated imagery. C. L. Kraft, C. L. Elworth, and C. D. Anderson (Boeing Aerospace Co., Seattle, Wash.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 63-73. Contract No. F33615-76-C-0516.

In the tests described, C-141 pilots were required to make aircraft landings with a 727-200 flight crew training simulator mounted on a three-degree-of-freedom base. The terrain image was computer generated and the 1000 TV line, full color scene was displayed at optical infinity with a resolution of 2.9 arcmin. Optical distortion panels placed between the pilot and the visual scene simulated a range of windscreen image qualities, from excellent to poor. During approaches, windscreen quality was found to interact significantly with the time of day to alter the flight pattern. Night

approaches with poor windscreens were considerably above glide slope, while better quality windscreens produced approaches on glide slope at night. Approaches were below glide slope for all day scenes, regardless of windscreen image quality. V.P.

A79-28166 Training effectiveness versus simulation realism. W. M. Bunker (General Electric Co., Daytona Beach, Fla.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 76-82. 6 refs.

Cost, energy, and safety considerations are continuously stimulating simulator development to provide increased simulation realism. However, the relationship between simulation realism and training effectiveness is far from simple. Realism itself is not a simple scaler; there are types of realism, and functions of realism must be considered in multidimensional space. This applies to cost as well as training effectiveness. Questions in this area may not be difficult to answer, once they are asked. There is a continual danger that important decisions will be made, and made incorrectly, due to failure to ask the pertinent questions. In the present paper, some surprising and nonintuitive results which have become apparent from a review of simulation experiments and training activities are discussed. V.P.

A79-28167 Transfer of landing skill after training with supplementary visual cues. G. Lintern (Canyon Research Group, Inc., Orlando, Fla.) and S. N. Roscoe (Illinois, University, Champaign, Ill.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 83-87. Contract No. F44620-76-C-0009.

An aircraft simulator with a closed-loop computer-generated visual display, was used to teach flight-naive subjects to land. A control training condition in which subjects learned to land with reference to a skeletal airport scene consisting of a horizon, runway, centerline, and aiming bar, was tested against training with constantly augmented feedback, adaptively augmented feedback, and a flightpath tracking display. A simulator-to-simulator transfer-of-training design showed that adaptively trained subjects performed best in a transfer task that was identical to the control group's training condition. Several subjects attempted six landings in a light airplane after they had completed their experimental work in the simulator. They performed better than another group of subjects that had not had any landing practice in the simulator. (Author)

A79-28168 ISAAC-1 - A color sensing robot. H. B. Tilton (Bell Technical Operations Corp., Killeen, Tex.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 88-92.

The design of color-sensing devices is generally based on Young's (1801) trichromatic theory, as quantified in the CIE system of color mixtures. The actual makeup of human color-vision mechanism, however, remains unknown to this day. Indeed, contrary to what the trichromatic theory hypothesizes, it now seems likely that the human color-vision system operates on a brightness-hue-saturation basis, rather than a red-green-blue basis. Indeed, there exists conclusive evidence that neutral hue signals originate in the retina from direct rod-cone interaction. ISAAC-1 is a simple optoelectronic device which models a possible neutral mechanism of generating such retinal hue signals. The model produces a pulse train that simulates the neutral signal. The frequency of the pulse train varies with changes in stimulus wavelength in a manner similar to the way retinal hue signals are believed to vary. Thus, the signals represent primitive hue information extracted from the stimulus. V.P.

A79-28169 Laser safety bioeffects research - Histopathology of retinal effects. E. S. Beatrice and S. Velez (U.S. Army, Letterman Army Institute of Research, San Francisco, Calif.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 103-106. 15 refs.

Previous research and derivation of permissible human exposure levels have been based on the acute (within one hour) retinal burn endpoint. Extrapolation of the results to derive permissible human exposure limits has resulted in the setting of standards which delineate only the single exposure conditions for intrabeam and extended source viewing criteria. In the present study, effects at levels far below the established minimum exposure levels were observed. A morphological and functional assessment of retinal changes due to laser radiation at various wavelengths at energy levels significantly below those previously considered 'safe' for direct beam viewing is presented. Suggestions for safe levels in pulsed scanned laser displays are made. V.P.

A79-28170 Extrapolation of pulsed light data in scanned displays. B. E. Stuck and D. J. Lund (U.S. Army, Letterman Army Institute of Research, San Francisco, Calif.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 107-111. 9 refs.

A laser scanned visual display system is evaluated with respect to recent research data and permissible exposure limits. The most stringent restriction on the illuminance of the display screen is placed in the case where the display is considered as a continuously illuminated extended source. The permissible irradiance on the screen for a 2-hour exposure is 9.16 mW/sq cm. The average irradiance is well within acceptable limits based upon the current ANSI standard. V.P.

A79-28171 Low level laser light effects. H. Zwick (U.S. Army, Letterman Army Institute of Research, San Francisco, Calif.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 112-118. 12 refs.

Viewing requirements in holography, laser display systems and, in general, repeated exposure to low levels of laser radiation require a more complete data base because present laser safety standards are limited in predicting the type of change in visual function that may result from viewing laser sources. In the studies described, very low laser radiation environments were simulated to determine the effects of repeated prolonged exposure on the visual function of the Rhesus. The results suggest that prolonged viewing of sources, even well below the present safety standards, can produce permanent changes in visual processes involved in human day (photopic) and night (scotopic) vision. The coherence of laser light is implicated as a significant factor in inducing these effects. It is recommended that individuals required to work in such environments be frequently evaluated for changes in visual function. V.P.

A79-28172 The holographic Pancake Window. J. A. LaRussa (Farrand Optical Co., Inc., Valhalla, N.Y.) and A. T. Gill (USAF, Human Resources Laboratory, Wright-Patterson AFB, Ohio). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 120-129.

The holographic Pancake Window developed by Farrand Optical Co. is an infinity display simulator for aircraft visual flight simulation. The device is relatively flat and can be used as both a pupil-forming and a nonpupil-forming display, in order to overcome size, weight, and head motion restrictions. The system employs reflective elements instead of refractive ones, leading to an increase in optical quality and a decrease in complexity. The original Pancake Mirror employs a spherical beamsplitter mirror to collimate rays from an image, allowing it to appear to be at infinity, and diagrams

of the apparatus are presented. The system is well suited to air-to-air combat simulation, however it was reasoned that a lighter and less costly window would encourage its greater use and so a holographic analog of the spherical beamsplitter mirror was developed to reduce window thickness. It was found that the holographic analog allowed the viewer to see a dispersion-free, narrowband, collimated image and windows 5/8 in. thick with a 17 in. diameter have been produced. A.L.W.

A79-28173 Application of Fresnel lenses to virtual image display. A. Cox (Austin Co., Advanced Technology Systems Div., Roselle, N.J.). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 130-137. Contract No. N61339-77-C-0113.

From the system packaging point of view a purely retracting system has much to recommend it. What has precluded the use of such systems, up to this time, has been the weight and bulk of the optical elements required, and their cost. The situation has been changed by the development of techniques for precision fabrication of large diameter Fresnel lenses, and it becomes feasible to construct refracting systems utilizing Fresnel lenses if the required aberrational performance can be achieved. The requirements which have been stipulated for a refracting system utilizing Fresnel elements are considered. Attention is given to the design approach, the design types examined, aspects of chromatic correction, and finite groove effects. G.R.

A79-28175 Real-time reconnaissance systems simulator. G. G. Kuperman and W. N. Kama (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Visual simulation and image realism; Proceedings of the Seminar, San Diego, Calif., August 30, 31, 1978. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1978, p. 146-156. 8 refs.

A facility was developed for assessing operator performance in target detection, recognition, and identification against simulated real-time and near real-time electro-optical sensor imagery. The basic element in the facility is a programmable image scanner utilized to generate simulated sensor imagery from a variety of sensors and under a wide range of flight profiles. The facility was applied to the evaluation of candidate sensors for a new reconnaissance system. A two-factors, repeated measures design was used in comparing three types of sensor at each of two combinations of airspeed and altitude. Significant findings were developed for the dependent measures of: percent of targets detected, time on display until detection, ground range at detection, slant range at detection, and displayed image scale at detection. Accuracy of interpretation and interpreter confidence did not yield significant results. Additionally, the facility is being used in studying FLIR operator display requirements and several weapon delivery concepts. (Author)

A79-28197 Perception of depth - Processing of simple positional disparity as a function of viewing distance. M. Ritter (Marburg, Universität, Marburg an der Lahn, West Germany). *Perception and Psychophysics,* vol. 25, no. 3, Mar. 1979, p. 209-214. 21 refs.

Dependency of perceived depth (relative to the fixation point) on disparity, viewing distance, and the type of the stereoscopic stimulus was investigated. Nearly complete constancy of depth, as required for a veridically matched perception, was observed only at small disparity values and with the larger square-formed stimulus; under these conditions, perceived depth corresponded well with real depth intervals for close viewing distances. Additionally, a model for perceptual processing of both variables, disparity and viewing distance, was applied to the data. (Author)

A79-28198 Omnidirectional increase in threshold for image shifts during saccadic eye movements. B. Bridgeman (California, University, Santa Cruz, Calif.) and L. Stark (California, University, Berkeley, Calif.). *Perception and Psychophysics,* vol. 25, no. 3, Mar. 1979, p. 241-243. 15 refs. Grant No. NIH-R01-EY-01482.

The failure of subjects to detect target movements occurring during eye movements provides a tool for investigating the mechanism responsible for subjective stabilization. An analysis of the problem is presented on the assumption that detection of target displacement is limited by the final position of the part of the target nearest the fovea, where acuity is best and motion thresholds are lowest. Discrepancies between pertinent results obtained by other investigators are discussed. It is concluded that human subjects are relatively insensitive to target movements during saccades, for their displacement thresholds rise from a few minutes of arc during fixation to over one-fifth of saccade amplitude during saccades. Saccadic suppression of displacement remains an important supplement to the 'frame-of-reference computation' mechanism. S.D.

A79-28332 Chromatic border distinctness - Not an index of hue or saturation differences. B. W. Tansley (California, University, La Jolla, Calif.) and A. Valberg (Oslo, Universitetet, Oslo, Norway). *Optical Society of America, Journal,* vol. 69, Jan. 1979, p. 113-118. 11 refs. Research supported by the Norges Almenvitenskapelige Forskningsrad; Grant No. NIH-EY-01541.

Some investigators have suggested that the distinctness of chromatic borders (i.e., borders visible in photic arrays of uniform luminance) can be used as an index of hue and saturation differences between lights. However, recent evidence indicates that only two types of cones in the trichromatic eye contribute to chromatic border perception. A series of experiments are reported that were designed to discriminate between these alternatives, utilizing mainly the short-wavelength visible spectrum. The results support the notion that only R and G cones in the trichromatic eye mediate the perception of chromatic borders; thus the distinctness of such borders alone cannot be used as an index of either hue or saturation differences, because both of these aspects of color involve contributions from B cones. (Author)

A79-28375 Smooth pursuit eye movements - Is perceived motion necessary. A. Mack, R. Fendrich, and J. Pleune (New School for Social Research, New York, N.Y.). *Science,* vol. 203, Mar. 30, 1979, p. 1361-1363. 8 refs. Grant No. NIH-2-R01-EY-1135.

Three experiments were conducted to ascertain whether perceived motion is necessary for smooth pursuit eye movements. In the first experiment, the pursuit behavior of the eye was examined for a set of stimulus velocities ranging from well below to well above the subject's detection thresholds. In the second, a moving frame of reference could be used to induce the perception of motion in a stimulus which was in fact stationary. In the third, eye movements were examined under conditions where the phenomenon of induced motion was employed to create a conflict between the direction of target's retinal motion and the perceived direction of its motion. The results demonstrated that retinal displacement in the absence of perceived motion is an adequate stimulus for pursuit, indicating that perceived motion cannot be considered necessary for pursuit. Further, in the cases where retinal and perceived motion conflicted, pursuit was found to be controlled by retinal and not by perceived motion. A.A.

STAR ENTRIES

N79-18354# Environmental Protection Agency, Research Triangle Park, N.C. Health Effects Research Lab.
THE EFFECTS OF H2SO4 ON MEN AND H2SO4 AND O3 ON LABORATORY ANIMALS
Donald E. Gardner, Milan Hazucha, John H. Knelson, and Frederick Miller *In* Automation Industries, Inc. Energy/Environment 3 Oct. 1978 p 51-60

Avail: NTIS HC A12/MF A01

Although sulfuric acid (H2SO4) is known to be a strong irritant, the results obtained through toxicological studies on animals and limited exposure studies on humans are so far inconclusive. A study of the effects of H2SO4 exposure on humans is outlined. The experimental design of an animal study designed to analyze the toxicological effects of O3 (ozone) and H2SO4 is also outlined. It was concluded, through these two studies, that there is an importance in studying pollutant agents both separately and especially in combination in order to determine environmental toxicology. G.Y.

N79-18554 British Library Lending Div., Boston Spa (England).
THE LYMPH NODES AND LYMPH VESSELS OF THE WHITE RAT
Rene Miotti Sep. 1978 43 p refs Transl. into ENGLISH from Acta Anat. (Switzerland), vol. 62, no. 4, p 489-527 (BLL-RTS-11309) Avail: British Library Lending Div., Boston Spa, Engl.

By injecting the lymphatics of white rats with dye the author was able to survey the topographic anatomy of the lymph vessels and nodes which, along with a summary discussion of the topographic histology of the lymph nodes, is described. Particular attention was focussed on the lymphatic drainage of the abdomen. G.Y.

N79-18555 British Library Lending Div., Boston Spa (England).
APHOTOMETER FOR DETERMINING THE BIOMASS OF MICROORGAN FROM THE ATP CONTENT
V. Ye. Yerokhin and A. F. Gordiyenko Oct. 1978 9 p refs Transl. into ENGLISH from Mikrobiol. Zh. (USSR), vol. 38, no. 4, 1976 p 508-511 (BLL-RTS-11456) Avail: British Library Lending Div., Boston Spa, Engl.

In the U.S.S.R. adenosine triphosphate (ATP) photometers are not mass produced. The instruments used for determining ATP, which were developed and made under laboratory conditions, vary greatly in their design and scope. It was the aim and purpose of this investigation to develop a photometer for the determination of ATP and other components of the adenyl system, which would be simple and convenient in use and in particular, would not require great technical expertise during its assembly and maintenance. The apparatus developed can also be used to determine ATP in biological objects in physiology and toxicological experiments. G.Y.

N79-18556 British Library Lending Div., Boston Spa (England).
THE UTILISATION OF ORGANIC COMPOUNDS BY PURPLE BACTERIA IN THE PRESENCE OF LIGHT
E. N. Kondrateva Aug. 1978 15 p refs Transl. into ENGLISH from Mikrobiologiya (USSR), v. 25, no. 4, 1956 p 393-400 (BLL-RTS-11213) Avail: British Library Lending Div., Boston Spa, Engl.

Facultative anaerobic purple bacteria were isolated in pure culture. The bacteria exhibited the ability to grow not only on media containing various organic compounds but also on purely mineral media containing Na2S, Na2S203, Na2S204 or H2 and did not require vitamin supplements of the medium for growth. The best substrates for growth of isolated bacteria were media containing salts of such organic acids as acetic, proprionic, pyruvic, succinic, fumaric or malic. Bacteria failed to grow under anaerobic conditions in the presence of light on media containing one of the enumerated acids, as also on media containing butyric or lactic acids, glucose or glycerol and lacking bicarbinate. The findings confirm that purple bacteria are, in the presence of light, able to utilize organic compounds, especially certain organic acids, as carbon source, and that these can replace carbon dioxide under defined conditions. G.Y.

N79-18557 Alabama Univ. in Birmingham.
THE EFFECT OF 17ALPHA-ETHYNYLESTRADIOL ON THE RADIATION SENSITIVITY OF MICE Ph.D. Thesis
Grace Louise Smith Brown 1978 99 p
Avail: Univ. Microfilms Order No. 7904268

The hormone, 17 alpha-ethynylestradiol, when administered to mice within 24 hours prior to lethal doses of whole-body ionizing radiation, produced substantial enhancement of survival following bone marrow injury. Of other hormones tested, northindrone produced similar effects to that of 17 alpha-ethynylestradiol; progesterone, 17 alpha-estradiol and 17 alpha-estradiol produced minimal effects; and diethylstilbestrol and testosterone were ineffective. The effectiveness of the hormone was established by using percent mortality values and by the study of histological sections of hemopoietic tissues, as well as other vital organs. These studies were made on mice which received hormone only, radiation only, and the combined treatment of hormone and radiation. The mechanism for this hormonal reaction was also studied. Dissert. Abstr.

N79-18558 Texas Univ. Health Science Center, Houston.
THE EFFECT OF INFECTION WITH HERPES SIMPLEX VIRUSES TYPES 1 AND 2 ON CELL DNA SYNTHESIS AND THYMIDINE KINASE ACTIVITIES IN CULTURED HUMAN CELLS Ph.D. Thesis
Jimmy Wayne Barnett 1978 139 p
Avail: Univ. Microfilms Order No. 7903773

A characteristic shared by oncogenic DNA viruses is the ability to stimulate lost cell DNA synthesis in stationary cells. Associated with this characteristic is the ability to stimulate the activities of cellular enzymes which are involved in DNA synthesis. Since herpes simplex virus types 1 and 2 have been shown to possess oncogenic potentials, these studies were undertaken in order to determine whether these two viruses also stimulate host cell DNA synthesis and thymidine kinase activities in stationary cells. The results show that like oncogenic papovaviruses and adenoviruses, HSV-2(333) stimulates host cell DNA synthesis and thymidine kinase activity in stationary cells which are permissive for virus replication. On the other hand, HSV-1 (MDAH) did not induce host cell DNA synthesis, but did stimulate thymidine kinase activity. Dissert. Abstr.

N79-18559 Northwestern Univ., Evanston, Ill.
RAMAN SPECTROSCOPY OF BIOLOGICAL MEMBRANES AND OTHER BIOLOGICAL SYSTEMS Ph.D. Thesis
Steven Charles Coheen 1978 109 p
Avail: Univ. Microfilms Order No. 7903267

Raman spectral studies of feline corneal collagen, dimyristoyl phosphatidylcholine-cholesteryl acetate mixtures, human erythrocyte membranes, membranes from human leukemic myeloblasts, and human erythrocyte membranes from which essentially all peripheral proteins have been removed are presented. From these studies, architectural information is revealed which relates to the biological membrane as well as other biological systems including connective tissue and atherosclerotic plaque. In several cases, previous interpretations of Raman active protein bands are questioned. Dissert. Abstr.

N79-18560 Missouri Univ. - Columbia.
SUPPRESSION OF THE IMMUNE RESPONSE BY ULTRASOUND Ph.D. Thesis
David Wesley Anderson 1978 162 p
Avail: Univ. Microfilms Order No. 7903886

The known sensitivities of cells involved in the immune response to many detrimental forces of physical and chemical nature, and the importance of these cells to human health, prompted this study on the effects of the widely applied diagnostic aid, ultrasound, on the immune response. Mice exposed to ultrasonic radiation of 2MHz at a maximum intensity of 8.9 mW/sq cm applied over the area of the spleen were examined for their ability to respond with hemagglutinins (HA) and hemolysins (HL) to an immunization with 1 percent suspension of sheep erythrocytes. A five minute exposure of ultrasound significantly reduced the mean HA and the HL titers. Ultrasonic exposures of 3.3 minutes and 1.6 minutes were correspondingly less suppressive. Examination of sera after mercaptoethanol treatment determined that experimental sera were deficient in IgM. Dissert. Abstr.

N79-18561 Missouri Univ. - Columbia.
A BIOCHEMICAL BASIS OF OBLIGATE ANAEROBIOSIS Ph.D. Thesis
Rial DeWitt Rolfe 1978 209 p
Avail: Univ. Microfilms Order No. 7903933

The effect of atmospheric oxygen on the viability of 13 strains of anaerobic bacteria, two strains of facultative bacteria, and one aerobic organism was examined. There were great variations in oxygen tolerance among the bacteria. An effort was made to relate the degree of oxygen tolerance with the activities of superoxide dismutase, catalase, and peroxidase in cell-free extracts of the bacteria. Catalase activity was variable among the bacteria and showed no relationship to oxygen tolerance. The ability of the bacteria to reduce oxygen was also examined and related to enzyme content and oxygen tolerance. The composition of the medium n which bacteria were grown had an effect on the level of the three enzymes. Dissert. Abstr.

N79-18562 Massachusetts Univ., Amherst.
CELL RESPONSE TO CHRONIC IRRADIATION-MODELING AND SIMULATION STUDIES Ph.D. Thesis
Andrew B. Walsh 1978 182 p
Avail: Univ. Microfilms Order No. 7903059

A combined mathematical model of cellular radiation response and proliferation is constructed in order to study the effects on growth of low dose-rate chronic adiation. The kinetic properties of the model are determined by computer solution of the rate equations. Model parameters for radiation response (including radiation-induced delay) and proliferation are determined for each stage of the cell cycle on the basis of acute irradiation experiments with V79 Chinese hamster cells. For the V79 cell system, exponential killing had to be included to fit the experiments in certain stages of the cell cycle. Similarities and differences between experimental results and computer simulations are discussed.
Dissert. Abstr.

N79-18563 Maryland Univ., College Park.
A THEORETICAL STUDY OF MEMBRANE DIFFUSION AND LYMPHOCYTE PATCHING Ph.D. Thesis
Michael Buas 1977 226 p
Avail: Univ. Microfilms Order No. 7903109

After a brief review of some of the experimental evidence for diffusion in biological membranes, an expression is derived for the two-dimensional diffusion-controlled collision rate between discs (idealized membrane proteins or antibodies) diffusing in a two-dimensional fluid (idealized membrane) on the surface of a sphere. An expression for the two-dimensional diffusion coefficient of such idealized discs is calculated. The approach is to proceed via macroscopic hydrodynamic calculations on the surface of a sphere. The equations of creeping motion appropriate in this geometry are formulated and solved. A discussion of some of the theoretical difficulties associated with the physical theory of two dimensional diffusion is also presented. These results are used to formulate a simple model of lymphocyte patching.
Dissert. Abstr.

N79-18564 George Washington Univ., Washington, D. C.
ISOLATION OF VIRUS-AUGMENTED TUMOR ANTIGENS Ph.D. Thesis
Faye Carol Gould Austin 1978 119 p
Avail: Univ. Microfilms Order No. 7903776

Based on the knowledge that membrane extracts of virus-infected cells demonstrate augmented TSTA activity, antigens solubilized from virus-infected cells were studied to determine if they would retain their augmented antigenicity. For this purpose, an SV40-transformed fibrosarcoma infected with influenza A virus was studied. The finding of enhanced TSTA activity in antigen fractions of low molecular weight supports the hypothesis that infectious virus is not required for augmentation of TSTA activity. The overall phenomenon of virus augmentation is dependent on several properties of the augmenting virus which may act cumulatively to enhance the activity of the tumor antigens. The procedures are applicable to the preparation of potent tumor antigens for use in the immunotherapy and/or immunodiagnosis of human cancer. Dissert. Abstr.

N79-18565 Colorado State Univ., Fort Collins.
EFFECTS OF LEAD ON SUBCELLULAR COMPONENTS IN BACTERIA Ph.D. Thesis
William Wesley Barrow 1978 135 p
Avail: Univ. Microfilms Order No. 7901858

It was demonstrated that actively growing Bacillus subtilis 168 cells, directly exposed to Pb(NO3)2, had decreased ability to bind the divalent cation, magnesium. The decreased affinity for magnesium was inconsistent with the absence of changes in the nature and quantity of the major cell wall metal binding components, teichoic and teichuronic acids. Purified cell walls, extracted from cells exposed to lead for 6 and 13 days, retained 9.9 micrograms Pb(+2) and 3.5 micrograms Pb(+2) mg cell wall, respectively; however, their ability to bind magnesium was not impaired. These results indicated that lead ions and their salts are not competitive for the teichoic and teichuronic acids that have been proposed as the specific binding sites for divalent cations. It must be concluded that the uptake and exclusion of metals, in general, from cells must exist by mechanisms in addition to those reported in the literature. Dissert. Abstr.

N79-18566# Army Medical Research Inst. of Infectious Diseases, Frederick, Md.
THE EFFECT OF ULTRASOUND ON BOTULIN TOXIN
G. Scheibner 20 Sep. 1978 14 p refs Transl. into ENGLISH from Tierarztl. Umschau, (USSR), no. 10, 1955 p 364-366
(AD-A059544) Avail: NTIS HC A02/MF A01 CSCL 06/20

The toxicity of type A botulin toxin obtained in a dialysis tube could be reduced by roughly a power of 10 by one hour of exposure to ultrasound waves (frequency 800 KHs, intensity ca. 2.42 W/sq cm. Type C toxin obtained from liver bouillon showed no reduction of toxicity for albino mice after the same ultrasound exposure. The difference in behavior may be due to the differences in the media used. G.Y.

N79-18567 British Library Lending Div., Boston Spa (England).
CLOZAPINE METABOLISM IN HUMANS
B. Stock et al Sep. 1978 24 p refs Transl. into ENGLISH from Arzneim.-Forsch. (West Germany), vol. 27, no. 5, 1977 p 982-990
(BLL-RTS-10902) Avail: British Library Lending Div., Boston Spa, Engl.

Clozapine, 1 (8-chloro-11-(4-methyl-1-piperazinyl)-5H-dibenzo-(b,e)(1,4)-diazepimne) is a neuroleptic drug which is extraordinarily effective in the treatment of schizophrenia and mania. It is metabolized in humans by exchange of the aromatic halogen for a hydroxy- or methyl-thio-group. Further metabolites are the N-dimethyl derivatives of four other compounds given. In addition a clozapine metabolite with an oxidised piperazine ring was found. The presence of a metabolite with an oxidised sulfur atom is suggested. Possible ways for the formation of these metabolites are discussed. G.Y.

N79-18568 British Library Lending Div., Boston Spa (England).
CRAWFORD AND LAVOISIER ON THE METHOD OF DEVELOPMENT AND PLACE OF FORMATION OF BODY HEAT

Peter Schmidt-Wiederkehr Sep. 1978 21 p refs Transl. into ENGLISH from Med. Monatsschr. (West Germany), v. 28, no. 10, 1974 p 453-459
(BLL-RTS-11228) Avail: British Library Lending Div., Boston Spa, Engl.

An attempt is made to show that Antoine Laurent Lavoisier (1743-1749) does in fact have a very important predecessor in Adair Crawford (1749-1795), whose work has quite unjustifiably remained in the shadow of that of Lavoisier. The theories put forward by the two scientists (one was a physicist and chemist and the other was first and foremost a doctor) were still full of gaps but nevertheless served as a pointer for future development. G.Y.

N79-18569 British Library Lending Div., Boston Spa (England).
RISKS FROM VARIOUS PRODUCTS USED IN PAINT SPRAYING
R. Collignon Oct. 1978 21 p Transl. into ENGLISH from Belogisch-Nederlands Tijdschrift voor Opperulaktetechnieken van Metallen (Belgium), v. 21, no. 10, 1977 p 318-323
(BLL-RTS-11499) Avail: British Library Lending Div., Boston Spa, Engl.

The following topics are outlined and discussed: (1) application procedures; (2) risks associated with paint spraying; (3) risks associated with the use of solvents, thinners and cleaning agents; (4) physio-pathology of organic solvents and thinners; (5) general pathology of the various classes of organic solvents; (6) synergistic action of toxins. G.Y.

N79-18570 British Library Lending Div., Boston Spa (England).
ALLERGY TO LANOLIN
E. Feuerman Aug. 1978 6 p refs Transl. into ENGLISH from Harefuah (West Germany), v. 86, no. 7, 1974 p 380-381
(BLL-RTS-11185) Avail: British Library Lending Div., Boston Spa, Engl.

Lanolin is frequently used as a base for ointment and creams in the treatment of dermatitis of all kinds. In such cases treatment can give rise to contact dermatitis as a result of an allergy to lanolin. The subject of lanolin as an allergenic is discussed. G.Y.

N79-18571 British Library Lending Div., Boston Spa (England).
OFFICIAL METHOD FOR DETERMINING OCULAR IRRITATION
Aug. 1978 10 p Transl. into ENGLISH from J. Office Repub. Fr. (France), 21 Apr. 1971 p 3863-3864
(BLL-RTS-11221) Avail: British Library Lending Div., Boston Spa, Engl.

An experimental method used to determine objectively the degree of ocular irritation caused by a substance when it is introduced into a rabbit's eye is presented. Outlined are the numerical values for evaluating the observed reactions on the cornea, iris and conjunctiva. Also presented is a method for evaluating superficial cutaneous irritation by means of repeated applications. Rabbits are also used for this experiment. G.Y.

N79-18572 British Library Lending Div., Boston Spa (England).
INFORMATION ON THE COMPARATIVE PHYSIOLOGY OF DIGESTIVE ENZYMES
P. A. Korzhuev and Kh. S. Koshtoyants Aug. 1978 22 p refs Transl. into ENGLISH from Zool. Zh. (USSR), v. 13, no. 1, 1934 p 71-81
(BLL-RTS-11203) Avail: British Library Lending Div., Boston Spa, Engl.

Already for a number of decades physiologists and zoologists have paid close attention to the question of the identity of the enzymes of cold- and warm-blood animals. An outline of the literature on the question is extremely revealing and its analysis represents an inseparable part of the treatment of the problem itself. That is why it was considered necessary to give a synopsis of the basic literature on this question, although it chiefly refers to another enzyme, namely pepsin. The results of experimental work on trypsins of various animals in relation to the temperature optimum and their heat stability is given. G.Y.

N79-18573 British Library Lending Div., Boston Spa (England).
THE DANGEROUS RELATION BETWEEN SUNBURN AND SKIN CANCER
K. Ishihara Sep. 1978 9 p Transl. into ENGLISH from Mainichi Life (Japan), 1973 p 24-27
(BLL-RTS-11310) Avail: British Library Lending Div., Boston Spa, Engl.

The following topics are discussed: (1) sun rays and their effects on the human body; (2) advantages and disadvantages of sunbathing; (3) care to be taken during sunbathing; (4) sunlight and skin cancer; and (5) skin resistance is the problem. G.Y.

N79-18574 British Library Lending Div., Boston Spa (England).
SOLAR RADIATION, LIGHT PROTECTION AND TANNING OF HUMAN SKIN
Wolfgang Bruhn Holzminden Dec. 1978 18 p refs Transl. into ENGLISH from Deut. Apoth. Ztg. (West Germany), vol. 117, no. 45, 1977 p 1872-1876
(BLL-RTS-11580) Avail: British Library Lending Div., Boston Spa, Engl.

The spectral properties of solar radiation and the production of artificial ultraviolet radiation are illustrated. The comformity of absorption, reflection and scattering of light to physical laws is discussed. Substances with sunscreen properties enable protection against over-intense radiation. Sixty-seven such substances and their trade names are summarized in a table. Comparison figures for evaluation of sunscreen substances are introduced. Reference is made to the most objective test methods in vivo and to the difficulties in their evaluation. The protection mechanism of skin tanning is looked at in detail. Nonlinear and photodynamic effects are also discussed. Self-tanning substances at present in wide use are introduced. G.Y.

N79-18575 Northwestern Univ., Evanston, Ill.
DYNAMIC MEASUREMENT OF HUMAN CYCLOFUSIONAL EYE MOVEMENTS Ph.D. Thesis
Mark James Sullivan 1978 153 p
Avail: Univ. Microfilms Order No. 7903371

The oculomotor response in the binocular visual mechanism of cyclofusion was measured dynamically and analyzed in several different experiments. Horizontal, vertical and torsional components of eye movement were recorded with a magnetic scleral search coil contact lens method. Data were obtained from two subjects who received cyclofusional stimulation in a wide angle tachistoscope providing stimulation over a wide field of view, up to approximately 50 degrees in diameter. The cyclofusional movements of the eyes in response to stimuli consisting of line patterns are primarily rotations approximately about each eye's line of sight. These cyclovergent eye torsions are slow compared with horizontal fusional eye movements but they show the asymptotic approach to final position which is characteristic of the much faster horizontal fusional eye movements.
Dissert. Abstr.

N79-18576 Virginia Univ., Charlottesville.
THERMODYNAMIC STUDIES ON THE OXYGENATION AND SUBUNIT ASSOCIATION OF HUMAN HEMOGLOBIN Ph.D. Thesis
Frederick C. Mills 1978 319 p
Avail: Univ. Microfilms Order No. 7903527

The linkage between oxygenation and subunit dissociation in human hemoglobin was studied experimentally. The principal approach employed was the determination of oxygen binding curves. This technique involves spectrophotometric monitoring of the state of oxygenation of a hemoglobin solution and simultaneous measurement of the free oxygen concentration in that solution by means of a polarographic oxygen electrode. The hemoglobin solution, initially at a state of high oxygen saturation, is continuously deoxygenated by equilibration with a stream of N2 to a state approaching 0% saturation. The resulting oxygenation curves were determined as a function of hemoglobin concentration and were studied as a function of temperature between 5 C and 37 C. Dissert. Abstr.

N79-18577 Texas Univ. Health Science Center, Dallas
A WIDE APERTURE FOCUSSED ULTRASOUND SYSTEM

FOR DETECTION OF BREAST CARCINOMA BY ULTRASONIC ATTENUATION Ph.D. Thesis
Gregory Allan McDaniel 1978 147 p
Avail: Univ. Microfilms Order No. 7902528

The design and testing of an acoustic system for imaging the human breast are described. In attempting to design a system which could be constructed in house, single element transducers were chosen for the system. The design simplified construction of the needed acoustic components and allowed the purchase of relatively inexpensive, low-noise electronic devices for signal processing. Dissert. Abstr.

N79-18578 Ohio Univ., Athens.
EVIDENCE FOR THE NEURAL REGULATION OF RESPIRATION DURING LOW INTENSITY EXERCISE IN MAN Ph.D. Thesis
David Eugene Millhorn 1978 195 p
Avail: Univ. Microfilms Order No. 7902187

Research was undertaken to more clearly define the mechanisms which regulate respiration in man during low intensity exercise. The transient respiratory responses of 2 trained and 2 untrained male subjects were determined by breath-by-breath analysis as the subjects proceeded from either non-pedaling rest or zero load pedaling rest to 40, 60 and 80 percent of their anaerobic threshold. Subjects were studied repeatedly for a period of time ranging from 6 to 15 months. Dissert. Abstr.

N79-18579 Virginia Univ., Charlottesville.
ANALYSIS OF VISIBLE SPECTRA AND THERMODYNAMIC PARAMETERS IN HEMEPROTEIN SYSTEMS Ph.D. Thesis
Barry Bernard Muhoberac 1978 275 p
Avail: Univ. Microfilms Order No. 7903521

Horse heart ferricytochrome-c at pH 11.0 in 0.3 M NaCl, 0.01 M PO4, was examined under the perturbation of methanol, ethanol, 1-propanol, and acetonitrile binding. The shapes of the optical difference spectra from 700 to 500 nm induced by ethanol and 1-propanol are almost identical and distinctly different from that of methanol. Dissociation constants and thermodynamic parameters were determined for methanol and 1-propanol from the difference spectra. They indicate that the dissociation process involves the first power of the alcohol concentration and that the inthalpy change accompanying dissociation of the methanol complex is independent of temperature, whereas that for the 1-propanol complex is highly temperature dependent. Thermodynamic models are discussed in detail, and it appears the dissociation of 1-propanol from the protein induces a significant conformational change, while little or none occurs with methanol. Dissert. Abstr.

N79-18580* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MINIATURE IMPLANTABLE ULTRASONIC ECHOSONOMETER Patent
Gilbert K. Kojima, inventor (to NASA) Issued 29 Aug. 1978 7 p Filed 12 Jan. 1977 Supersedes N77-15621 (15 - 06, p 20786
(NASA-Case-ARC-11035-1; US-Patent-4,109,644; US-Patent-Appl-SN-758721; US-Patent-Class-128-2V; US-Patent-Class-128-2.05Z; US-Patent-Class-128-2.1A) Avail: US Patent and Trademark Office CSCL 06B

A miniature echosonometer adapted for implantation in the interior of an animal for imaging the internal structure of a organ, tissue or vessel is presented. The echosonometer includes a receiver/transmitter circuit which is coupled to an ultrasonic transducer. Power is coupled to the echosonometer by electromagnetic induction through the animal's skin. Imaging signals from the echosonometer are electromagnetically transmitted through the animal's skin to an external readout apparatus.
Official Gazette of the U.S. Patent and Trademark Office

N79-18581# Civil Aeromedical Inst., Oklahoma City, Okla.
STRESS IN AIR TRAFFIC CONTROLLERS: A RESTUDY OF 32 CONTROLLERS 5 TO 9 YEARS LATER
C. E. Melton, J. M. McKenzir, S. M. Wicks, and J. T. Saldivar Oct. 1978 10 p refs
(FAA-AM-78-40) Avail: NTIS HC A02/MF A01

Thirty-two subjects who had participated in air traffic controller stress studies 5-9 years earlier were restudied with regard to urinary excretion of 17-ketogenic steroids, epinephrine, and norepinephrine. All subjects showed decreases in excretion of 17-ketogenic steroids. Eight of the subjects had taken noncontroller jobs: these subjects showed work-related increase in epinephrine excretion whereas the 24 controllers who remained active in controlling aircraft showed work-related decreases in epinephrine excretion. There were no significant findings related to norepinephrine excretion. It is concluded that the active controller group shows evidence of reduced chronic stress. Various interpretations of this finding include less stress at their new facilities, greater experience in their jobs, improvements in the entire traffic control system, and the effects of normal aging. Author

N79-18582# Civil Aeromedical Inst., Oklahoma City, Okla.
CHARACTERISTICS OF MEDICALLY DISQUALIFIED AIRMAN APPLICANTS IN CALENDAR YEARS 1975 AND 1976
Shirley J. Dark and Audie W. Davis Sep. 1978 31 p refs
(FAA-AM-78-25) Avail: NTIS HC A03/MF A01

Comprehensive data are provided reflecting pertinent denial rates with respect to the medical and general attributes of those airmen denied medical certification in calendar years 1975 and 1976. Also provided are such descriptive epidemiologic data as age, sex, occupation, class of medical certificate applied for, medically disqualified applicants. Data on airline pilot denials are also included. As anticipated, general aviation and new applicants contributed greatly to total denials, reflecting that the latter are being screened for the first time. G.Y.

N79-18583# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
CRITERIA FOR MAXIMUM TOLERABLE HEAT STRESS. A PROPOSAL
W. A. Lotens 1978 30 p refs In DUTCH; ENGLISH summary
(Contract A77/K/011)
(IZF-1978-13; TDCK-70890) Avail: NTIS HC A03/MF A01

An attempt was made to set criteria for the maximum tolerable heat stress in order to protect wearers of clothing from heat illness in field as well as in laboratory conditions. A quantitative analysis was carried out of heat stress, heat strain and illness. Predictive systems for heat stress were compared and in practical situations the Predicted Rectal Temperature seems to be very useful. In case of severe heat stress predicted heat storage may be more suitable. In the laboratory, subjects are under continuous control and therefore predictions are unnecessary. Criteria are given for temperature, heat storage and heart rate depending on the task (working, resting or standing) and the duration. G.Y.

N79-18584# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
OBSERVABILITY OF ELECTRICAL HEART ACTIVITY STUDIED WITH SINGULAR VALUE DECOMPOSITION
J. J. vanderKam and A. A. H. Damen Feb. 1978 50 p refs
(TH-78-E-81; ISBN-9-061-44081-5) Avail: NTIS HC A03/MF A01

The singular value decomposition (SVD) is a mathematical operation on a matrix. When this procedure is applied to the matrix that is made up of samples of the measured potentials on the skin, a basis of independent components is constructed. About nine of these components define the skin potentials within the noise margin. They contain practically all information available on the skin. When the SVD is performed on the transfer matrix that relates potentials on the heart surface to potentials on the skin, components are found that can be interpreted as basic potential distributions over the heart surface that cause a potential distribution over the skin. The relative contribution of each basic heart pattern to the total skin potential is a measure for the observability of that basic distribution over the heart surface. G.Y.

N79-18585# California State Air Resources Board, Sacramento.
HUMAN HEALTH DAMAGES FROM MOBILE SOURCE AIR POLLUTION: A DELPHI METHOD, VOLUME 1 Final Report, 1 Jul. 1973 - 30 Jun. 1974
Steve Leung (Eureka Labs., Sacramento, Calif.), Elliot Goldstein (Calif. Univ., Davis), and Norman Dalkey (Calif. Univ., Los Angeles) Jul. 1978 272 p refs
(Contract EPA-68-01-1889)
(PB-288319/7; EPA-600/5-78-016A-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 06T

The California Air Resources Board conducted a survey of 14 health experts on the human damages from mobile source air pollution. A variant of the Delphi technique was used to arrive at a consensus judgment of the experts on the dose-response relationship for photochemical oxidants, nitrogen dioxide and carbon monoxide. The panel experts were requested to answer questionnaires to provide dose-response for all three pollutants and for healthy individuals as well as diseased or sensitive persons. The completed questionnaires were analyzed and the group consensus were sent to the panel members. The panel experts were asked to answer the same questionnaires again for a second time. The data obtained during the second round represents the final group consensus. In the first round survey, there was good agreement among the panel experts for the health effects of oxidant on all categories of population, while the data for both carbon monoxide and nitrogen dioxide was much less so. The results of the second round survey showed improvement in group agreement for all three pollutants. GRA

N79-18586# California State Air Resources Board, Sacramento.
HUMAN HEALTH DAMAGES FROM MOBILE SOURCE AIR POLLUTION: ADDITIONAL DELPHI DATA ANALYSIS, VOLUME 2 Final Report
Steve Leung and Normal Dalkey (Calif. Univ., Los Angeles) Jul. 1978 92 p refs Prepared in Cooperation with Eureka Labs., Inc., Sacramento, Calif.
(Contract EPA-68-01-1889)
(PB-288320/5; EPA-600/5-78-016B) Avail: NTIS HC A05/MF A01 CSCL 06T

The results of analyses of the data generated by a panel of medical experts for a study of Human Damages from Mobile Source Air Pollution (Hereafter, referred to as HHD) conducted by the California Air Resources Board for the U.S. Environmental Protection Agency are reported. The analysis focused on two topics: (1) assessment of the accuracy of group estimates and (2) generation of a model of the group estimate as a function of percent of population affected and degree of impairment. Investigation of the first topic required a more thorough formulation of the statistical theory of errors as applied to group judgement than has been available up to now. A major new feature of this theory is the postulation of a psychonumeric scaling on estimated numbers analogous to the psychophysical scaling of sensory magnitudes. Author

N79-18587# Tennessee Univ., Knoxville. Dept. of Psychology.
ESTIMATION OF THE OPERATING CHARACTERISTICS OF ITEM RESPONSE CATEGORIES, 3: THE NORMAL APPROACH METHOD AND THE PEARSON SYSTEM
Fumiko Samejima 15 Jun. 1978 117 p refs
(Contract N00014-77-C-0360; NR Proj. 150-402; RR0420401)
(AD-A056747; RR-78-2) Avail: NTIS HC A06/MF A01 CSCL 05/10

Two variations of the conditional P.D.F. method for estimating the operating characteristics of item response categories are introduced. In the normal approach method, the conditional distribution of theta, given its maximum likelihood estimate, is approximated by a normal distribution, with its two parameters derived theoretically, by using the estimated probability density function of the maximum likelihood estimate. In the Pearson system method, the conditional distribution is approximated by one of the Pearson System distributions, depending upon the value of the criterion kappa computed from the four conditional moments of theta, given its maximum likelihood estimate. The same simulated data for 500 hypothetical examinees and ten binary items are used, as in the two-parameter beta method. The results are compared with those obtained by the Two-Parameter Beta Method. J.M.S.

N79-18588# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE DRIVING SIMULATOR DEVELOPED BY THE INSTITUTE FOR PERCEPTION TNO. A VALIDATION STUDY IN STRAIGHT ROAD DRIVING Progress Report
G. J. Blaauw, A. R. A. vdHorst, and J. Godthelp 1978 30 p refs In DUTCH; ENGLISH summary
(IZF-1978-16-PR-1; TDCK-70887) Avail: NTIS HC A03/MF A01

Inexperienced as well as experienced drivers had to drive in the simulator on a straight freeway. Results were compared with the data of a similar full-scale study with an instrumented car on the road. In both experiments the driver task was manipulated by specific instructions for lateral and longitudinal vehicle control. Especially, in lateral vehicle control the simulator appeared to differ from real driving in an absolute as well as relative way. It seems necessary to measure the dynamics of the simulator and instrumented car accurately and to modify the dynamics of the simulator in closer correspondence with the instrumented car. Only then it makes sense to continue closed-loop (validation) experiments. G.Y.

N79-18589# National Technical Information Service, Springfield, Va.
STRESS FACTORS ON PILOT PERFORMANCE. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Dec. 1978
Elizabeth A. Harrison Dec. 1978 196 p Supersedes NTIS/PS-77/1160; NTIS/PS-76/1043; NTIS/PS-75/890; NTIS/PS-75/033
(NTIS/PS-78/1289/4; NTIS/PS-77/1160; NTIS/PS-76/1043; NTIS/PS-75/890; NTIS/PS-75/033) Avail: NTIS HC $28.00/MF $28.00 CSCL 06S

The selected abstracts of research reports cover acceleration, circadian rhythms, physiology, psychology, neurology, man-machine systems, high altitude effects, noise effects, and vibration effects as related to stress factors on pilot performance. GRA

N79-18590 British Library Lending Div., Boston Spa (England).
METHOD AND ARRANGEMENT FOR THE PREPARATION OF SOLID FOODSTUFFS FOR LONG-TERM STORAGE
K. Peterson and G. Lindstroem Oct. 1978 9 p refs Transl. into ENGLISH from Swedish patent, No. 342388, 1972
(BLL-RTS-11445) Avail: British Library Lending Div., Boston Spa, Engl.

A method is presented for preparing foodstuffs for long term storage, such as deep freeze storage, by first sterilizing them and thereafter providing them with a coating which partly protects them against outside attack by putrefactive bacteria and the like. The coating also partly prevents them from drying out while retaining vitamins and other valuable constituents. An apparatus for accomplishing the method is included. G.Y.

N79-18591# Civil Aeromedical Inst., Oklahoma City, Okla.
TIME-SHARING ABILITY IN COMPLEX PERFORMANCE: AN EXPANDED REPLICATION
E. Dean Chiles and Alan E. Jennings Sep. 1978 18 p refs
(FAA-AM-78-33) Avail: NTIS HC A02/MF A01

Factor analyses were performed on data from 51 subjects tested on the CAMI Multiple Task Performance Battery (MTPB). Five different complex performance task combinations were used as well as the six individual MTPB tasks performed by themselves. The primary treatment of the data involved factor analyses of the tasks of the five different complex tasks along with appropriate measures of the tasks performed singly. The results were interpreted to support the hypothesized existence of a time-sharing ability. Orthogonal factors were found on which the monitoring tasks, in general, loaded during simple performance; the monitoring tasks loaded on separate orthogonal factors when they were performed as a part of a complex task. Potential relevance of these findings to aviation selection and performance research programs is noted. Author

N79-18592*# Houston Univ., Tex.
MAN-MACHINE ANALYSIS OF TRANSLATION AND WORK TASKS OF SKYLAB FILMS Final Report
James R. Morrow and John Boelter (Texas Univ., Odessa) [1978] 49 p refs
(Contract NAS9-15521)
(NASA-CR-151879) Avail: NTIS HC A03/MF A01 CSCL 05H

Selected film segments were digitized. An efficiency of translation scale was developed, and each of 200 segments of film were rated with regard to the astronauts translation characteristics. Results indicated that in general the astronauts were able to acclimate themselves to the zero g environment quite well. Results also indicated that astronauts tended to translate in 1 g orientations when in the experimental compartment and the wardroom which were architecturally 1 g. However, when the astronauts were in the forward compartment, which was zero g oriented, they began to translate more frequently in a zero g manner. There appeared to be improvements in translation across time. These improvements appeared more so in the forward compartment than in the wardroom or the experimental compartment. Possible changes in the architecture of the wardroom and the experimental compartment were suggested in order to improve translation within these compartments.
J.A.M.

N79-18593# Ingenieurbuero fuer Ergonomie, Munich (West Germany).
INVESTIGATION ON THE EFFECT OF MECHANICAL PROPERTIES OF CONTROL ELEMENTS ON HUMAN CONTROL PERFORMANCE UNDER STOCHASTIC ROLL VIBRATIONS [UNTERSUCHUNG UEBER DEN EINFLUSS DER MECHANISCHEN EIGENSCHAFTEN VON BEDIENELEMENTEN AUF DIE STEUERLEISTUNG DES MENSCHEN BEI STOCHASTISCHEN ROLLSCHWINGUNGEN]
Heinzpeter Ruehmann Bonn DOKZENTBW 1978 198 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-78-11) Avail: NTIS HC A09/MF A01; DOKZENTBW DM 40

Analysis of vibration stress in man machine systems and its effects on human performance shows that decreases in sensory-motor tasks are primarily due to direct mechanical interference mechanisms on the processes of visual perception and motor reactions. Random roll-vibrations of different intensities in a one-degree of freedom simulator were studied. Experiments were run for a two-dimensional compensatory tracking task of a low frequency irregular track. Three basic types of control systems, i.e. position, velocity and acceleration control, as well as four types of hand controllers with different force/displacement characteristics were the independent variables of this experiment. The tracking experiments carried out with eight subjects indicate, that for each kind of controlled element used, tracking performance may be influenced by a respectively suitable choice of the joystick's control loading. For tracking of undelayed position systems, underlying great disturbances caused by vibration inputs, viscously damped sticks are preferred for reducing vibration-induced movements of the handarm-system. F.O.S.

N79-18594# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
STEERING BEHAVIOUR AND MANUAL CONTROL ACTIONS. PART 1: AN EVALUATION OF THE LITERATURE AND A RESEARCH PLAN
J. Godthelp 1978 67 p refs In DUTCH; ENGLISH summary (IZF-1978-3; TDCK-70429) Avail: NTIS HC A04/MF A01

The literature on the effect of the structure of manual control actions on performance in a steering task, i.e. steering a car, is discussed. G.Y.

N79-18595# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
VESTIBULAR MODELS AND THRESHOLDS OF MOTION PERCEPTION. RESULT OF TESTS IN A FLIGHT SIMULATOR
R. J. A. W. Hosman and J. C. VanderVaart Apr. 1978 83 p refs
(VTH-LR-265) Avail: NTIS HC A05/MF A01

Thresholds for the perception of angular acceleration and specific forces were experimentally determined by using sinusoidally changing stimuli at a number of frequencies in a moving base flight simulator. The measured thresholds for angular accelerations wer significantly lower than those commonly found in the literature. It was further shown that mentally loading subjects with additional tasks considerably increased the thresholds for motion perception. Finally, some recommendations for the use of the mathematical models for motion perception in pilot modelling and flight simulation are given. G.Y.

N79-18945# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.
APPLICATION OF NUMERICAL METHODS TO PHYSIOLOGICAL FLOWS
Thomas J. Mueller *In* Von Karman Inst. for Fluid Dyn. Computational Fluid Dyn., Vol. 1 1976 95 p refs Sponsored in part by Am. Heart Assoc. and NSF

Avail: NTIS HC A19/MF A01

Finite difference numerical methods are applied to the Navier-Stokes equations for problems related to axisymmetric heart valves and planar and axisymmetric local vessel constriction. The favorable comparison of these techniques with experimental results permits their use in the study of complicated unsteady separated flow phenomena which are difficult to produce and study in physical experiments. A.R.H.

N79-19020*# Jackman (K. R.), La Jolla, Calif.
TELEMEDICINE: AN EXPANDING NEW SCIENCE ON LAND AND SEA
K. R. Jackman and Anthony J. Rippo (Marine Med. Serv., Inc., San Diego, Calif.) *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 105-121 refs

Avail: NTIS HC A20/MF A01 CSCL 06E

Several medical and technical men in San Diego County are concerned with the need in many rural communities for a 24-hour day, 7-days a week access to adequate medical care. People isolated from urban areas by travel-times of 40-minutes tend to delay seeking early and effective medical care. The authors were able to assemble quality technology which permits narrow-band video-pictures, better known in the CB trade as ROBOT slow-scan television (SSTV), to be transmitted over telephone lines, by micro-wave, through satellite-bounce, or by HF-radio. These 'ROBOT' pictures can be accompanied with explanatory audio communication and with diagnostic signals from electronic instruments. G.Y.

N79-19021*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF HYPODYNAMIC SIMULATIONS ON THE SKELETAL SYSTEM OF MONKEYS
D. R. Young and J. W. Tremor *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 123-140 refs
Avail: NTIS HC A20/MF A01 CSCL 06C

A research and development program was undertaken to evaluate the skeletal losses of subhuman primates in hypodynamic environments. The goals of the program are: (1) to uncover the mechanisms by which weightlessness affects the skeletal system; (2) to determine the consequences and reversibility of bone mineral losses; and (3) to acquire a body of data needed to formulate an appropriate countermeasure program for the prevention of skeletal deconditioning. Space flight experiment simulation facilities are under development and will be tested for their capability in supporting certain of the requirements for these investigations. G.Y.

N79-19022*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRCRAFT FLIGHT SIMULATION OF SPACELAB EXPERIMENT USING AN IMPLANTED TELEMETRY SYSTEM TO OBTAIN CARDIOVASCULAR DATA FROM THE MONKEY

E. P. McCutcheon, R. Miranda, T. B. Fryer, G. Hodges, B. D. Newson, and N. Pace *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 141-153 refs

Avail: NTIS HC A20/MF A01 CSCL 06B

The utility of a multichannel implantable telemetry system for obtaining cardiovascular data was tested in a monkey with a CV-990 aircraft flight simulation of a space flight experiment. Valuable data were obtained to aid planning and execution of flight experiments using chronically instrumented animals. Author

N79-19025*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE EFFECT OF 1 TO 5 keV ELECTRONS ON THE REPRODUCTIVE INTEGRITY OF MICROORGANISMS
J. Barengoltz and J. Brady (Bionetics Corp.) *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 179-188 refs
(Contract NAS7-100)
Avail: NTIS HC A20/MF A01 CSCL 06C

Microorganisms were exposed to simulated space environment in order to assess the effect of electrons in the energy range 1 to 5 keV on their colony-forming ability. The test system consisted of an electron gun and power supply, a dosimetry subsystem, and a vacuum subsystem. The system was capable of current densities ranging from 0.1 nA/sq cm to 5 micro A/sq cm on a 25 sq on target and an ultimate vacuum of 0.0006 N/sq m (0.000004 torr). The results of the experimental program show a significant reduction in microbial reproductive integrity. Author

N79-19026*# Stillman Coll., Tuscaloosa, Ala.
DEVELOPMENTAL AND HEMATOLOGICAL RESPONSES TO LOW LEVEL CONTINUOUS EXPOSURE OF NITROGEN DIOXIDE IN MICE
Jarnail Singh *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 189-196 refs

(Grant NIH-MBS-08021)
Avail: NTIS HC A20/MF A01 CSCL 06C

Young healthy mice were continuously exposed to 0ppm, 0.5ppm, 1.0ppm and 5ppm nitrogen dioxide gas for eight weeks. Nitrogen dioxide exposure for eight weeks decreased the average weight of mice, increased the average weight of lungs, heart, and brain and decreased the average weight of liver. Nitrogen dioxide exposure did not have any effects on the WBC and RBC in mice blood but it increased the HCT and HGB in mice blood. Nitrogen dioxide exposure increased the MCV and decreased the MCH and MCHC in mice blood. Author

N79-19027*# Stillman Coll., Tuscaloosa, Ala.
ELECTROPHORESIS PATTERN OF SERUM FROM MICE EXPOSED TO DIFFERENT CONCENTRATIONS OF SULFUR DIOXIDE
Jarnail Singh *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 197-200 refs

(Grant NIH-MBS-08021)
Avail: NTIS HC A20/MF A01 CSCL 06C

Three day old mice were continuously exposed to sulphur dioxide concentrations at 0ppm, 0.05ppm, 0.15ppm and 1ppm for eight weeks. At the end of the experiment, blood samples were collected and centrifuged for electrophoresis studies of the serum in 5 percent acrylamide gel. The length of bands of different serum proteins from the SO2 exposed mice was at a variance as compared with the length of bands from the control exposed mice and alpha-1 band seems to be missing from the serum of SO2 exposed mice. Author

N79-19028*# Stillman Coll., Tuscaloosa, Ala.
THE EFFECTS OF THE POLLUTANT, SODIUM CYANIDE, ON THE MORPHOLOGY AND PHYSIOLOGY OF OEDOGONIUM CARDIACUM
Elbert Sparks *In* NASA. Goddard Space Flight Center Ninth Conf. on Space Simulation 1977 p 201-209 refs
(Grant RR0802104)
Avail: NTIS HC A20/MF A01 CSCL 06C

Oedogonium cardiacum exposed to varying concentrations of sodium cyanide for 15 day periods exhibited both morphological and physiological alterations. Organisms were exposed to the pollutant in concentrations of 1, 10, 25, 50, and 100 parts per million. Exposure period for organisms in each concentration was 15 days. As the concentration of the pollutant increased fragmentation also increased. Exposure also caused organisms to lose chlorophyll. The third morphological alteration was the incidence of rupture. Physiological effects altered by exposure included: reduced oxygen evolution, retardation of starch production and death. Death occurs when organisms are exposed to high concentrations over the total 15 day period. Author

N79-19591 State Univ. of New York at Buffalo.
STUDY OF MODEL MEMBRANE FUSION USING PHOTON CORRELATION SPECTROSCOPY Ph.D. Thesis
Shao-Tang Sun 1978 88 p
Avail: Univ. Microfilms Order No. 7905325

The kinetics and extent of fusion of phospholipid vesicles - model biomembranes were studied. The temperature dependence of calcium-induced fusion of phosphatidylserine vesicles and phosphatidylserine/phosphatidylcholine mixtures was measured to determine the relationship between vesicle fusion and bilayer phase transition. Sonicated vesicles were incubated for several hours at constant temperatures in the presence of a specific calcium concentration. The chelating agent EDTA was then added. The average size of the resulting large vesicles was measured using photon correlation spectroscopy. This final vesicle size served as a measure of the extent of the calcium-induced fusion during incubation. The graph of this extent of fusion against incubation temperature showed a sharp maximum at the bilayer phase transition temperature which unequivocally gives the first direct evidence of the importance of phase transition in the fusion process. Dissert. Abstr.

N79-19592*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
RADAR, INSECT POPULATION ECOLOGY, AND PEST MANAGEMENT
Charles R. Vaughn, ed., Wayne Wolf, ed. (Dept. of Agriculture, Beltsville, Md.), and Waldemar Klassen, ed. Mar. 1979 252 p refs Workshop held at Wallops Island, Va., 2-4 May 1978; sponsored in part by US Dept. of Agriculture
(NASA-CP-2070) Avail: NTIS HC A12/MF A01 CSCL 06C

Discussions included: (1) the potential role of radar in insect ecology studies and pest management; (2) the potential role of radar in correlating atmospheric phenomena with insect movement; (3) the present and future radar systems; (4) program objectives required to adapt radar to insect ecology studies and pest management; and (5) the specific action items to achieve the objectives.

N79-19593*# North Carolina State Univ., Raleigh.
THE ROLE OF INSECT DISPERSAL AND MIGRATION IN POPULATION PROCESSES
R. L. Rabb and R. E. Stinner *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 3-16 refs

Avail: NTIS HC A12/MF A01 CSCL 06C

Movement functions in the population dynamics of insects are discussed. Modes of movement, movement from a population view, and population patterns are described and predicted. A wide-area of spatial and temporal patterns are presented. S.E.S.

N79-19594*# California Univ., Riverside.
SHORT-RANGE MOVEMENT OF MAJOR AGRICULTURAL PESTS
Robert VanSteenwyk *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 17-21 refs
Avail: NTIS HC A12/MF A01 CSCL 06C

Visual observations of population fluctuations which cannot be accounted for by either mortality or natality are presented. Lygus bugs in the westside of the San Joaquin Valley of California are used as an example. The dispersal of most agricultural pests in one of the less known facets of their biology is discussed. Results indicate a better understanding of insect movement is needed to develop a sound pest management program. S.E.S.

N79-19595*# Department of Agriculture, Phoenix, Ariz.
SELECTED EXAMPLES OF DISPERSAL OF ARTHROPODS ASSOCIATED WITH AGRICULTURAL CROP AND ANIMAL PRODUCTION
T. J. Henneberry *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 23-33 refs
Avail: NTIS HC A12/MF A01 CSCL 06C

The economic importance of arthropods in agricultural production systems and the possibilities of using dispersal behavior to develop and manipulate control are examined. Examples of long and short distance dispersal of economic insect pests and beneficial species from cool season host reservoirs and overwintering sites are presented. Significant dispersal of these species often occurring during crop and animal production is discussed. S.E.S.

N79-19596*# Forest Service, Hamden, Conn.
DISPERSAL OF FOREST INSECTS
Michael L. McManus *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 35-39 refs
Avail: NTIS HC A12/MF A01 CSCL 06C

Dispersal flights of selected species of forest insects which are associated with periodic outbreaks of pests that occur over large contiguous forested areas are discussed. Gypsy moths, spruce budworms, and forest tent caterpillars were studied for their massive migrations in forested areas. Results indicate that large dispersals into forested areas are due to the females, except in the case of the gypsy moth. S.E.S.

N79-19597*# Department of Agriculture, Beltsville, Md.
STRATEGIC AND TACTICAL USE OF MOVEMENT INFORMATION IN PEST MANAGEMENT
E. F. Knipling *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 41-57 refs
Avail: NTIS HC A12/MF A01 CSCL 06C

Several insect movement problems are discussed. Much more information is needed to make a better appraisal of the practical significance of the insect dispersal problem. Data on the time, rate, and extent of movement of insects are provided. Better techniques for measuring insect movement are developed. A better understanding of the importance of insect movement in the development and implementation of more effective and ecologically acceptable pest management strategies and tactics was proved. S.E.S.

N79-19598*# Naval Research Lab., Washington, D. C. Radar Div.
CAPABILITIES OF RADAR AS THEY MIGHT RELATE TO ENTOMOLOGICAL STUDIES
Merrill I. Skolnik *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 61-79
Avail: NTIS HC A12/MF A01 CSCL 06C

A tutoral background of radar capabilities and its potential for insect research is provided. The basic principles and concepts of radar were reviewed. Information on current radar equipment was examined. Specific issues related to insect research included; target cross-section, radar frequency, tracking target recognition and false alarms, clutter reduction, radar transmitter power, and ascertained atmospheric processes. S.E.S.

N79-19599*# Centre for Overseas Pest Research, London (England).
POSSIBLE IMPACT OF RADAR ON PEST MANAGEMENT OPERATIONS
R. C. Rainey *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 81-86 refs
Avail: NTIS HC A12/MF A01 CSCL 06C

Radar in making and maintaining contact with the most important populations of major pests in different stages of flight is presented. The desert locust and the African armyworm are discussed in understanding problems and developing a more effective control of pests. S.E.S.

N79-19600*# Army Electronics Command, Fort Monmouth, N. J.
RADAR OBSERVATION OF INSECTS: MOSQUITOES
Emerson Frost (Rutgers Univ.) and Jere Downing *In* NASA. Wallops Flight Center Radar, Insect Population Ecology, and Pest Management Mar. 1979 p 87-112 refs
Avail: NTIS HC A12/MF A01 CSCL 06C

Tests were conducted at several sites over the coastal lowlands of New Jersey and over a region of high plains and low mountains in Oklahoma. In one area, a salt marsh in New Jersey, extensive ground tests were combined with laboratory data on expected insect backscatter to arrive at an extremely convincing model of the insect origin of most Dot Angels. A great deal of insight was studied from radar on the buildup and dispersal of insect swarms, since radar can follow where other means of trapping and observation cannot. Data on large-scale behavior as a function of wind and topography are presented. Displayed techniques which show individual or small swarm motion within some larger cloud or mass, or which can show the overall motion over great distances were developed. The influence of wind and terrain on insect motion and dispersal is determined from radar data. S.E.S.

N79-19605# Advisory Group for Aerospace Research and Development, Paris (France).
OPERATIONAL HELICOPTER AVIATION MEDICINE
S. C. Knapp, ed. (Army Aeromed. Res. Lab.) Dec. 1978 614 p refs In ENGLISH and FRENCH Meeting held at Fort Rucker, Ala., 1-5 May 1978
(AGARD-CP-255; ISBN-92-835-0226-4) Avail: NTIS HC A99/MF A01

Aviation medicine topics unique to helicopters, helicopter operations, and the aircrew who fly helicopters are discussed. Specific topics covered include: medical aspects of evacuation and search and rescue operations; environmental aspects of helicopter operations; helicopter operations crew fatigue; human factors of helicopter design and operations; visual and acoustic aspects of helicopter design and operations; and helicopter safety and crashworthiness.

N79-19609# German Air Force, Porz-Wahn (West Germany). Helicopter Transportation Wing.
NIGHT RESCUE OPERATION PROCEDURE OVER SEA WITH BELL UH-1D HELICOPTERS
Heinz Knoche *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 8 p refs
Avail: NTIS HC A99/MF A01

Flight physiological aspects and disorientation problems of night rescue missions with Bell UH- 1 D helicopters are shown. Countermeasures which have proved to be successful in fighting disorientation are mentioned. J.M.S.

N79-19612# Army Aeromedical Research Lab., Fort Rucker, Ala.
AN EVALUATION OF THE EFFECTS OF A STABILITY AUGMENTATION SYSTEM UPON AVIATOR PERFORM-

ANCE/WORKLOAD DURING A MEDEVAC HIGH HOVER OPERATION
M. G. Sanders, R. I. Burden, Jr., R. R. Simmons, M. A. Lees, and K. A. Kimball *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 9 p

Avail: NTIS HC A99/MF A01

A method of aiding the MedEvac pilot in performing a hover maneuver while perhaps reducing workloads was investigated. A modular, four-axes stability augmentation system (Ministab) with integrated rate attitude and heading retention was installed on the USAARL JUH-1H helicopter. Participating personnel for the project were nine US Army aviators with a total average of 1172 flight hours. The aviators hovered at 30 feet above ground level for five minutes under each of the three following flight control conditions: (1) unaided--normal hover with visual flight rules conditions; (2) using Force Trim; and (3) using the Ministab. Continuous information from twenty pilot and aircraft monitoring points was recorded on an incremental digital recorder for all flights. Multivariate analyses were performed on both aircraft status variables and control input workload/activity measures. Under the conditions tested, the stability augmentation system evaluated did not provide a clearcut improvement in flight performance and workload across all flight parameters. J.M.S.

N79-19617# Max-Planck-Institut, Bad Kreuznach (West Germany). Anthropotechnics Working Group.
HUMAN EXPOSURE TO MECHANICAL VIBRATION AT LYING POSTURE IN THE AMBULANCE HELICOPTER UH-1D
Heinrich Dupuis *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 11 p refs

Avail: NTIS HC A99/MF A01

The vibration exposure of wounded or sick people during transportation by the UH-1D helicopter was investigated. Accelerations were measured at the mounting parts of the stretcher, at four points of transferring from the stretcher to the human body, and at two places upon the body. This was done under 11 flight situations: racing the engine, ground running, lifting up, suspense-flight, ascending-flight, horizontal-flight 60, 80, 100 and 116 kn, landing-flight and running out the engine. Effective values (rms) of acceleration and frequency analysis were used as a basis for evaluation. The vibration stress was found to be about 90% smaller when transported by helicopter than by wheeled vehicles. The middle of the three positions of the stretcher showed the relative lowest vibration comparing upper and ground position. From the mounting parts of the stretcher to the points of entrance into the body vibration decreases at about 90%. Besides low frequencies (5 to 10 Hz) high frequency vibration (30 to 50 Hz) was found. J.M.S.

N79-19618# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PROTECTIVE APPROACHES IN THE MODERATION OF THE PHYSIOLOGICAL EFFECTS OF EXTREME AMBIENT CONDITIONS IN HELICOPTER OPERATIONS
Louis J. SantaMaria *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 7 p refs

Avail: NTIS HC A99/MF A01

To study the effectiveness of a head cooling system, three subjects were individually exposed to ambient temperature levels of 32.2 C and 40.6 C. Tests were conducted with and without head cooling under resting conditions. Under conditions of light activity simulating an increase in metabolic heat production of 150-200 KCAL/hr, only the cooling mode was used at each ambient temperature. The assessment was based on temperature and comfort sensation, skin and body temperature, heart rate and total weight loss. The moderating effects of head cooling were indicated in the setting-resting conditions; with exercise the advantages were less apparent, possibly as a result of system limitations. In the cold water phase, the encapsulating life raft (ELR) and the USN LR-1 raft were tested at three levels of air-water temperature conditions, i.e., 15.6 C/10 C, 7.2 C/1.6 C, and 2.8 C/-6/7 C, and a constant wind velocity of 25 km/hr. Two volunteer subjects were similarly equipped with minimal personal protective equipment. The advantages gained by the use of the ELR were indicated in terms of body temperatures and subjective reports even under the most stressful conditions of the program. J.M.S.

N79-19619# Army Aeromedical Research Lab., Fort Rucker, Ala.
IN-FLIGHT TOXICOLOGY OF FIXED AND ROTARY WING AIRCRAFT CREW STATIONS
Gary D. Pollard and Doris W. Hirsch *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 7 p refs

Avail: NTIS HC A99/MF A01

A system was designed and developed for the measurement of toxic gases while in flight. The system is based on the use of several instruments including a multichannel infrared spectrometer, a mass spectrometer as well as several other instruments and techniques. The techniques were applied to the evaluation of weapons gases and contamination from engine exhaust in the Utility Tactical Transport Aircraft System (UTTAS) as well as other aircraft systems. Results are presented. J.M.S.

N79-19620# German Air Force, Porz-Wahn (West Germany). Helicopter Transportation Wing.
BACKACHE IN UH-1D HELICOPTER CREWS
H. C. Schulte-Wintrop (LTK, Munster, W. Ger.) and H. Knoche *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 12 p refs

Avail: NTIS HC A99/MF A01

A questionnaire was prepared and handed to the crews (6). Out of a total of 145 pilots, flight engineers and air rescue medics questioned 40% complained of backache during flight and 51% of backache after flight. The steady RPM setting during normal flight was marked to cause discomfort in 37% of the cases as opposed to only 4% when increasing RPM. In 39% of the cases the pain was described as a lasting one. 29% reported one of short duration. In 34% it was felt in the middle of the back over the dorsal process, in 54% in the lumbar region, and in only 17% in the neck. It is concluded that the following factors are causative to backache in helicopter crews: vibration; seating posture; draft; lack of specific exercises; and vertebral abnormalities. J.M.S.

N79-19622# Advisory Group for Aerospace Research and Development, Paris (France). Aerospace Medical Panel.
EVALUATION OF AIRCREW FATIGUE DURING OPERATIONAL HELICOPTER FLIGHT MISSION
C. Koch (Italian Air Force, Rome) and F. Monesi *In its* Operational Helicopter Aviation Med. Dec. 1978 2 p refs

Avail: NTIS HC A99/MF A01

Monitoring of physiological parameters for the assessment of workload in laboratory and also field studies is described. In-flight recordings of ECG, breathing rate and amplitude, EMG, EEG, EOG and Gz were transmitted telemetrically from the helicopter crew station to the ground receiving station. The investigators were provided with some objective data on the increase in biological cost for an Agusta/Bell 204 helicopter pilot trying to maintain a given level of performance. In fact, the same task was performed by the pilot in two successive phases of an operational flight mission, the latter being more demanding. The crucial question is which physiological parameters prove of practical value in revealing the onset of a state of acute fatigue. Undoubtedly, breathing rate and amplitude show relatively early changes with the increase in workload during helicopter flying (Pettyjohn) as well as EMG and EOG. However, adequate computerized analysis of other physiological and behavioral parameters is necessary to provide the investigator with more subtle tools for the identification of fatigue. J.M.S.

N79-19623# Army Aeromedical Research Lab., Fort Rucker, Ala.
CHANGES IN THE ROTARY WING AVIATOR'S ABILITY TO PERFORM AN UNCOMMON LOW ALTITUDE REARWARD HOVER MANEUVER AS A FUNCTION OF EXTENDED FLIGHT REQUIREMENTS AND AVIATOR FATIGUE
M. A. Lees, R. R. Simmons, L. W. Stone, and K. A. Kimball *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 14 p refs
Avail: NTIS HC A99/MF A01

Changes in man-helicopter system performance for a variety of flight maneuvers were examined. The system performance changes in the rearward hover maneuver across five days of an extended flight schedule are described. System performance is categorized into measures of the pilot's control performance, measures of the aircraft's stability, and combined measures of total system performance for each primary aircraft control channel. System performance changes across the five flight days and within the flight days were examined using multivariate analysis. Significant changes in each aircraft control channel are presented and the overall changes in system performance are discussed.
J.M.S.

N79-19624# Wood (William C.), Memphis, Tenn.
IMPLEMENTATION OF A DIVISIONAL AVIATION PROGRAM TO DECREASE FLIGHT CREW FATIGUE
William C. Wood *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 7 p refs

Avail: NTIS HC A99/MF A01

A vigorous and continuing program to recognize aviator fatigue implemented in the U.S. First Armored Division in Europe is described. Aviators are given lectures which review the various stresses inherent in aviation. The two types of aviator fatigue, acute skill fatigue and chronic skill fatigue, are discussed in detail. The emphasis is on recognition by the aviators themselves of symptoms and signs of fatigue. Flight hour limitation is an important part of a crew rest program, but does not replace the other elements as presented. Prevention of fatigue and recognition of fatigue which has developed is an essential component of an aviation safety program.
J.M.S.

N79-19626# British Aerospace Dynamics Group, Bristol (England).
VISUAL EFFECTS OF HELICOPTER MANEUVRE ON WEAPON AIMING PERFORMANCE
P. R. Michael, T. E. Jardine, and M. K. Goom *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 15 p refs

Avail: NTIS HC A99/MF A01

The problem areas associated with the guidance of command-to-line-of-sight missiles from helicopters were examined and assessed experimentally. The weapon system considered employed a sight which was stabilized in pitch and yaw and which incorporated a manually operated servocontrol for moving the sight in azimuth and elevation. Four interactions likely to degrade performance were studied. These were: (1) the simultaneous use of sight and missile controls; (2) helicopter vibration; (3) helicopter forward motion; and (4) helicopter maneuver (roll, pitch and yaw). Results of a first series of simulation experiments established that, in general, helicopter vibration and forward motion did not degrade the operators' performance and that an operator could use the sight and missile guidance controls simultaneously without loss of accuracy. However, any helicopter maneuver which caused the field-of-view through the sight to roll was found to cause considerable degradation of performance, regardless of any previous flying experience of the subjects. This effect of roll phasing (cross coupling) was investigated in a second series of simulations which contained some experiments where a system of roll compensation was used. This compensation caused the missile axes to appear and remain parallel to a graticule in the sight, and the field-of-view retained its attitude at launch throughout the engagement. Provided the compensation was able to reduce roll phasing to less than 20 deg there was no degradation in performance.
J.M.S.

N79-19627# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
HUMAN FACTORS EVALUATIONS OF TODAY'S HELICOPTERS AS AN AID TO FUTURE SYSTEMS DESIGN
E. J. Lovesey *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 7 p refs

Avail: NTIS HC A99/MF A01

Methods of identifying the shortcomings of helicopter weapon systems and avionics design are discussed in terms of the interface with the operator. Cine filming, eyemark, and voice recording are considered along with structured interviews and questionnaires. Emphasis is placed on discovery of good human features and shortcomings in order to eradicate the bad in future designs.
J.M.S.

N79-19628# Hughes Helicopters, Culver City, Calif. Human Factors Engineering.
TADRAP: A COMPUTER-AIDED TECHNIQUE FOR REDUCING AIRCREW TASK ANALYSIS DATA
David E. Gobuty *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 9 p ref

Avail: NTIS HC A99/MF A01

As part of the human factors engineering activity during design of the YAH-64 advanced attack helicopter, a technique was developed for the computer aided reduction of aircrew task analysis data. The Task Analysis Data Reduction and Analysis Program (TADRAP) begins with the processing of raw data from a classical task analysis which was structured around a five-tiered pyramidal scheme for mission description. Once coded and keypunched, TADRAP converts the task analysis data into estimates of operator workload based upon expected task completion time, plus weighted values representing the complexity factors of action cycle, sensory modality, and task position. The TADRAP facilitates task analysis validation and presents workload data in tabular form. Future plans include expanding TADRAP routines to provide computer graphics illustrations of analyzed mission profiles.
J.M.S.

N79-19629# Paris V Univ. (France). Laboratoire d'Anthropologie et d'Ecologie Humaine.
THE USE OF BIOSTEREOMETRY IN HELICOPTER COCKPIT DESIGN [UTILISATION D'UNE METHODE DE BIOSTEREOMETRIE DANS LA CONCEPTION D'UN POSTE DE PILOTAGE D'HELICOPTERE]
A. Coblentz, Y. Deloison, G. Ignazi, and J. Prudent *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 19 p In FRENCH
Avail: NTIS HC A99/MF A01

The functional anthropometric characteristics of French land force helicopter pilots were analyzed to define new norms for equipping pilot stations and making them adaptable to the needs of the operators. An apparatus was developed which can be raised by each anatomic point and by each point chosen on the equipment. A simulator of the pilot station was constructed so that the X, Y, Z coordinates could be obtained in a fixed reference geometry. The precise results obtained were used in the simulator and the ergonometric and data and dimensions were integrated. With the use of this three dimensional measurement system, the adjustments necessary to provide comfort to different subjects were measured and pilot positions were analyzed so the variations in pilot attitude could be considered in the simulated pilot performance. Transl. by A.R.H.

N79-19630# National Aerospace Lab., Amsterdam (Netherlands).
AN ANALYSIS OF HELICOPTER PILOT CONTROL BEHAVIOR AND WORKLOAD DURING INSTRUMENT FLYING TASKS
J. Smit and Wewerinke *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 11 p refs

Avail: NTIS HC A99/MF A01

During helicopter instrument hover and navigation (tracking) tasks a number of flight data, physiological measures and subjective ratings were collected. Mathematical models were used

to describe and analyze the pilot's control behavior and attention workload. The optimal control model seems to offer a suitable framework for the description of control tasks as complex as helicopter instrument flying. A control effort model, which was formulated in terms of the optimal control model, describes the relationship between performance and attention paid to the task. The physiological variables and subjective ratings in general reflected the variations in control effort connected with the various tasks. J.M.S.

N79-19632# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
HUMAN FACTOR ENGINEERING TEST AND EVALUATION OF THE US NAVY LAMPS HELICOPTER SYSTEM
Patrick M. Curran, George J. Laurent, and Paul M. Linton *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 8 p refs
Avail: NTIS HC A99/MF A01

The human factors engineering (HFE) planning, implementation, and contributions in the evaluation of the U.S. Navy Light Airborne Multi-purpose System (LAMPS) during calibrated range and open-sea operations are presented. Human factor engineering participation in this overall program was directed to the critical evaluation of the interfaces among the various system operators and their equipments in the two LAMPS system versions. The adequacy of the air and ship crews and their station designs in the two LAMPS system versions was assessed. The major sources of HFE data were subjective: operator questionnaire; structured observations; and tape-recorded interviews. Objective data included mission key-event printouts, internal communication system (ICS) voice tapes, and aircraft and shipboard display photographs. Conclusions are presented and discussed. J.M.S.

N79-19633# Centre d'Etudes et de Recherches, Toulon (France).
A DESCRIPTION OF THE RECENT NEUROPSYCHOLOGICAL SELECTION OF PILOTS FOR LAND FORCES LIGHT AIRCRAFT [DESCRITION DE LA NOUVELLE SELECTION NEUROPSYCHOLOGIQUES DES PILOTES DE L'AVIATION LEGERE DE L'ARMEEE DE TERRE]
E. J. Caille, D. Ziane (Aviation Legere de l'Armee de Terre, Villacoublay Air, France), A. Goavec (Antenne-Aviation Legere de L'Armee de Terre, Vincennes, France), and A. Elzear (Antenne-Aviation Legere de l'Armee de Terre, Vincennes, France) *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 6 p
Avail: NTIS HC A99/MF A01

Modern methods of automatic recording and analysis are used in an experimental battery of tests developed between 1974 and 1977 and validated on 200 operational helicopter pilots. The principal originality of the new selection process rests in the objective study of vulnerability manifested in the course of controlled situations (voluntary hypernea, intermittent luminous simulation, mental calculation, and muscular exercise) as manifested on EEG and EEC. The tracings are subjected to harmonic analysis and treated in real time on microprocessors. Classic cognitive tests, six psychometric questionnaires, and proof of piloting capability as demonstrated in a simulator are included in the pilot selection process. Transl. by A.R.H.

N79-19634# Hopital Begin, St. Mande (France).
RADIOLOGICAL EXAMINATION OF THE RACHIS AND FITNESS FOR EMPLOYMENT AS A HELICOPTER PILOT [EXAMEN RADIOLOGIQUE DU RACHIS ET APTITUDE AL'EMPLOI DE PILOTE D'HELICOPTERE]
R. P. Delahaye, Auffret, and P. J. Metges *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 3 p refs In FRENCH

Avail: NTIS HC A99/MF A01

Spinal pain in helicopter pilots is due partly to the pilot's position and partly to vibrations generated by the aircraft. Clinical medicine shows that spinal pain has a variable intensity ranging from a simple annoyance to a painful ache. The chronic discomfort that evolves with or without pain during or after flight is caused by the pilot's position and is not experienced by airplane pilots. Both clinical and physiopathological evidence supports the arguments that a specific standard of aptitude should be applied in the selection of helicopter pilots. A common standard of aptitude cannot be developed for both combat aircraft and helicopter pilots because the lumbar rachis and the lumbo-sacral joint constitute the critical segment for the helicopter pilot, while the dorsal rachis and dorso-lumbar joint are the most critical in combat aircraft pilots following ejection. Transl. by A.R.H.

N79-19635# Royal Naval Air Medical School, Seafield Park (England).
A SYSTEM OF TRAINING IN AVIATION PHYSIOLOGY AND HUMAN FACTORS FOR ARMY AND NAVY HELICOPTER AIRCREW
P. S. Ormerod *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 9 p refs

Avail: NTIS HC A99/MF A01

Aeromedical training courses designed specifically for helicopter aircrews are described. Methods used to devise the present courses and the factors considered to be important in determining the usefulness of aeromedical training to aircrews are emphasized. J.M.S.

N79-19636# Textron Bell Helicopter, Ft. Worth, Tex. Human Factors and Cockpit Arrangement Group.
VISUAL REQUIREMENTS FOR THE HELICOPTER PILOT
William F. Lowe *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 6 p ref

Avail: NTIS HC A99/MF A01

Flight test results of pilots flying obstacle avoidance maneuvers are discussed. Prediction that pilots would maneuver closer to obstacles on their side of the aircraft as opposed to obstacles on the copilot/observer side and that as speed of fly-by maneuvers increased the distance required for safe clearance would increase were not completely supported by the data. Explanation of these contradictory results are offered. A survey of commercial operators to determine the unique requirements of their operations is included along with a vision plot of a new commercial twin turbine helicopter. J.M.S.

N79-19637# Coast Guard, Alameda, Calif.
OBSERVATION OF NIGHT SHIPBOARD HELICOPTER OPERATIONS FROM A 210 FOOT US COAST GUARD CUTTER
W. W. Harvey, Jr. *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 6 p refs

Avail: NTIS HC A99/MF A01

Night helicopter operations were conducted to observe the effectiveness of flight deck lighting. These observations are outlined, and a simple review of visual perception is given. Emphasis is placed on improving safety aspects of night flight. J.M.S.

N79-19638# Army Aeromedical Research Unit, Fort Rucker, Ala.
OCULOMOTOR PERFORMANCE OF AVIATORS DURING AN AUTOROTATION MANEUVER IN A HELICOPTER SIMULATOR
Richard N. Armstrong, Gerald P. Krueger, John H. Sapp, and Yvonna F. Jones *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 14 p refs

Avail: NTIS HC A99/MF A01

The oculomotor performance of ten US Army pilots, a group of five experienced and a group of five newly graduated aviators, was filmed during helicopter simulator flights conducted under precision instrument flight conditions. Each pilot flew a one hour precision instrument flight in a simulator on each of four days. On the fourth day, the flight scenario included a simulated engine failure that required the pilot to execute an autorotation maneuver. Oculomotor performance, pilot control, and aircraft flight dynamic measures were recorded during the fourth flight. The allocation of pilot visual activity to various instruments was observed to differ as a function of two phases of the autorotation maneuver. Pilots controlled rotor speed and airspeed closer to desired limits in the second phase than they did in the initial phase of the autorotation. Few differences of pilot visual activity were exhibited as a function of the experience level of the pilots. J.M.S.

N79-19639# Centre de Recherches de Medecine Aeronautique, Paris (France).
PROVIDING AN EYE SEPARATOR ON A COLOR CATHODE TUBE [POUVOIR SEPARATEUR DE L'OELL SUR TUBE CATHODIQUE COULEUR]
G. F. Santucci *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 10 p refs In FRENCH

Avail: NTIS HC A99/MF A01

The visual acuity of simultaneously colored contrast on a radar video buffer television screen was studied using originally designed apparatus. Equal luminance was used during tests of the following colors: red, green, blue, purple, greenish-blue, yellow, and white. Tests conducted on 60 pilots between the ages of 20 and 50 resulted in the definition of the optimum proportion of character needed to assure recognition of form with good probability, as well as the precise contrast of color needed for rapid perception. The data thus obtained permits optimal reading of informtion on a cathode tube. Transl. by A.R.H.

N79-19640# Army Aeromedical Research Lab., Fort Rucker, Ala.
VISUAL PERFORMANCE/WORKLOAD OF HELICOPTER PILOTS DURING INSTRUMENT FLIGHT
R. R. Simmons, M. A. Lees, and K. A. Kimball *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 17 p refs

Avail: NTIS HC A99/MF A01

Visual and psychomotor performance data was collected in an attempt to investigate and study the general visual performance of aviators during IFR conditions. Two groups of aviators, with varied experience levels, were the subjects. A NAC Eye Mark Recorder and the Helicopter In-Flight Monitoring System were utilized to collect the required data. The results indicated, among other findings, that pilot subjective opinion does not agree with objective data. Additionally, the attitude indicator and radio compass comprised over 60 percent of the pilot's total visual workload, while the aircraft's status gauges were monitored less than 10 percent of the total time. These data should provide invaluable information concerning the visual requirements of pilots for safe helicopter operations. J.M.S.

N79-19642# Federal Aviation Agency, Oklahoma City, Okla. Aviation Physiology Lab.
VISUAL AND OPTICAL ASSESSMENT OF GAS PROTECTIVE FACE MASKS
K. W. Welsh and J. A. Vaughan *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 7 p refs
Avail: NTIS HC A99/MF A01

The visual characteristics of ophthalmic design requirements for smoke/gas protective face masks for pilots and aircrew members were studied. Visual tests with the mask in place indlude: (1) peripheral field of vision; (2) visual acuity; (3) stereoscopic depth perception; (4) color vision; and (5) spectacle frame displacement. Measurements were made on five adult males (age range 35 to 54 years) while wearing each of the 26 devices and again without the masks. Reduction in the temporal and inferior field was found with some of the goggle-mask (two-piece) combinations. These data indicate that 30.8 percent of the test items degraded visual acuity below 20/20 at the 0.4 m distance, 15.4 percent at 0.76 m, and 7.6 percent at 6.0 m. Mean values of depth perception ranged from 2.4 percent to 404.4 percent over control (no mask) values. The three goggles with tinted facepieces created no alterations in color perception. Spectacles worn with the two-piece protective masks were displaced upward on the face. Full-face (one-piece) masks displaced the spectacles downward. Suggested criteria for an acceptable protective mask are discussed. J.M.S.

N79-19644# Italian Air Force Medical Service H. Q., Rome.
SENSORIAL ASPECTS OF HELICOPTER OPERATIONS

Gaetano Rotondo *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 5 p refs

Avail: NTIS HC A99/MF A01

The effects of sensorial phenomena related to the use of rotor-powered aircraft are examined, as components of physical and psychic workload in the piloting of helicopters, and therefore, as possible pathogenetic concurrent factors of operational fatigue in helicopter aircrews. Particularly, acoustic and nonacoustic vibrations are discussed with special reference to the effects exerted by vibratory motions on visual function. Another problem taken into consideration is the disorientation that the pilot may experience whenever there is a conflict between his own sensorial evaluations and the information supplied by the instruments. The means that might be employed for the purpose of ascertaining functional changes and possibly preventing negative effects produced by sensorial phenomena, are examined in order to attain a high degree of flight safety in helicopter operations as a result of the prevention of flight accidents due to the human factor. J.M.S.

N79-19645# Army Aeromedical Research Lab., Fort Rucker, Ala. Bioacoustics Div.
THE EFFECTIVE ACOUSTIC ENVIRONMENT OF HELICOPTER CREWMEN
Robert T. Camp, Jr. and Ben T. Mozo *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 2 p

Avail: NTIS HC A99/MF A01

Measurements taken to determine the acoustic environment of helicopter crewmen are discussed. It is indicated that the attenuation characteristics of helmets and hearing protectors and the variables of the physiology of the human ear as well as the acoustic hazards of voice communications systems, influence the overall acoustic environment of the flight personnel. J.M.S.

N79-19648# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
DISORIENTATION IN ROYAL NAVAL HELICOPTER PILOTS
A. P. Steel-Perkins and D. A. Evans (Royal Naval Air Medical School, Hillhead, England) *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 5 p refs

Avail: NTIS HC A99/MF A01

The incidence of pilot disorientation in fixed and rotary wing aircraft was investigated. Information regarding special orientation problems of naval helicopter pilots engaged in operations at sea and landing on moving platforms was obtained when a survey of 104 active USN pilots was reported. This questionnaire was adapted and distributed to Royal Navy helicopter pilots. The aims of the surveys were that useful information would be obtained on aircraft manning, cockpit and instrument design for future helicopter pilots regarding disorientation and thus a possible improvement in flight safety. J.M.S.

N79-19649# Army Aeromedical Research Lab., Fort Rucker, Ala.
OPERATIONAL CONSIDERATION OF AN/PVS-5 NIGHT VISION GOGGLES FOR HELICOPTER NIGHT FLIGHT
Wun C. Chiou *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 9 p refs
Avail: NTIS HC A99/MF A01

Experimental results and operational problems are discussed in which artificial illumination is being utilized to increase helicopter night vision goggle (NVG) training duration when ambient illumination is insufficient. Two types of artificial illumination were evaluated. The first type utilizes the existing helicopter landing light as an illumination source. The second type uses auxiliary external illumination sources such as a searchlight. A modified one kilowatt AN/VSS-4 (XG-4) armored illuminator and the fire-fly lighting system were flight tested. Results reveal that the former provides a far better illumination pattern than the latter. Spectral transmission characteristics and optical quality of these artificial illumination sources are given in detail. Various advantages and disadvantages of using one kind versus the other will also be discussed in detail. It is shown that an artificial illumination source or a combination of various sources can be utilized to increase the helicopter NVG training time at night. J.M.S.

N79-19650# Army Aeromedical Research Lab., Fort Rucker, Ala.

TRAINING REQUIREMENTS FOR HELICOPTER OPERATION WITH NIGHT VISION GOGGLES

Isaac Behar, Dana M. Young, and James E. Johnson *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 4 p refs

Avail: NTIS HC A99/MF A01

The Army Aviation Center experience in night vision goggle (NVG) stagefield training at night which identified numerous problem areas and their remediation are described. An evaluation of an approach to circumventing many of these problems as well as providing an added margin of safety by providing the initial part of the NVG training during the daytime using appropriate filters for the goggles is included. J.M.S.

N79-19651# Army Aeromedical Research Lab., Fort Rucker, Ala.

HEAD AIMING/TRACKING ACCURACY IN A HELICOPTER ENVIRONMENT

Robert W. Verona *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 18 p refs

Avail: NTIS HC A99/MF A01

This experiment was conducted to measure man's head aiming/tracking capability using a helmet mounted sighting device. The influences of target speed, helmet suspension types, sighting eye dominance, and helmet weighting parameters on head aiming/tracking were investigated. If the aiming/tracking accuracy was sensitive to manipulation of the man machine interface parameters, then it would seem to indicate that improved aiming/tracking accuracy could be obtained by improving the interface. The factors analyzed were: eye dominance, helmet weighting, target speed, and helmet suspension. The eye dominance and target speed factors were statistically significant. However, the only factor of practical significance was target speed. A subject aiming at a static target with his head has an RMS error of about 3.5 milliradians. If the target begins to move 4 deg/sec the error increases to about 10.5 milli-radians. When the subject begins to vibrate too, the error increases to 13 milliradians. If the target speed doubles as he is vibrating, the error increases to 16.8 milliradians. J.M.S.

N79-19652# Army Aeromedical Research Lab., Fort Rucker, Ala.

AVIATOR VISUAL PERFORMANCE: A COMPARATIVE STUDY OF A HELICOPTER SIMULATOR AND THE UH-1 HELICOPTER

R. R. Simmons, M. A. Lees, and K. A. Kimball *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 13 p refs

Avail: NTIS HC A99/MF A01

The visual performance/workload of pilots during helicopter and simulated helicopter instrument flights was compared. The corneal reflection technique was utilized to obtain the visual data. Although pilot performance in the Army's UH-1FS simulator and the UH-1H helicopter were similar, several differences were noted. Additionally, the zone/cost factor theory was expanded. Pilots visual requirements for safe mission accomplishment was emphasized. J.M.S.

N79-19656# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).

VERTEBRAL PAINS IN HELICOPTER PILOTS [LES ALGIES VERTEBRALES DES PILOTES D'HELICOPTERES]

R. Auffret, R. P. Delahaye, P. J. Metges, and Vicens *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 7 p In FRENCH Avail: NTIS HC A99/MF A01

Despite progress in aeronautical technology, pathological conditions of the rachis caused by piloting helicopters still persists. On the functional level, lumbar pain is the main constituents of the chronic condition and is often compounded by shooting pains, sometimes associated with sciatica, whose delayed appearance is, without doubt, caused by flight rhythms. Radiology reveals the presence of arthrosis signs and, on occasion, a congenital anomaly. In 30 percent of the cases studied, radiology is normal. Dorsal pain exists in about 50 percent of the cases with discrete signs of arthrosis in the 8th, 9th, and 10th vertebrae. Clinical evidence of this is practically nonexistent in the population studied. In all of the pilots examined a type of arthrosis is revealed in the 5th, 6th, and 7th cervical vertebrae, often associated with cervical rectitude in the sagital plane. These dorsal and cervical radiological anomalies appear with great frequency in relatively young subjects. Transl. by A.R.H.

N79-19662# Louisiana State Univ., Shreveport. School of Medicine.

BIOMEDICAL CONSTRAINTS ON THERMAL PROTECTIVE FLIGHT CLOTHING DESIGN: A BIOENGINEERING ANALYSIS

Francis S. Knox, III, Thomas L. Wachtel (California Univ., San Diego), and Stanley C. Knapp (Army Aeromedical Research Lab., Ft. Rucker, Ala.) *In* AGARD Operational Helicopter Aviation Med. Dec. 1978 11 p refs

Avail: NTIS HC A99/MF A01

From studies of the dynamics of large JP-4 fuel fires and of instrumented helicopter hulks immersed in such fires, the worst credible postcrash fire environment was defined. Data from these fires allowed the the construction and calibration of a JP-4 fueled postcrash fire simulator. This simulator was used to expose 95 domestic white pigs (animal for human skin) to simulated postcrash fires of various intensities and various durations. In some instances fabrics (e.g., Nomex) were placed between the fire and the pig. The resultant burns were graded on surface appearance and on depth of damage. The relationship between thermal energy and burn depth is complex and depends on, among other things, initial skin temperature, skin color, length of hair stubble, exposure time, and amount and rate of tissue water boiling. Fabrics tend to lower the amount of energy transmitted to the skin provided they remain intact and maintain an insulating air layer. The experimental burn data presented and survival data from the Natural Burn Information Exchange form the basis of a rational consideration of the biomedical constraints on thermal protective flight clothing design when compared with textile engineering and cost factors. J.M.S.

N79-19667# Mississippi State Univ., Mississippi State. Dept. of Botany.

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH M.S. Thesis

William W. Sage May 1978 55 p refs

(Contract DI-14-34-0001-7052)

(PB-288982/2; W79-01356; OWRT-A-099-MISS(2)) Avail: NTIS HC A04/MF A01 CSCL 08A

Samples of edaphic bluegreen algal communities were selected from five monotypic angiosperm zones in Graveline Bay Marsh near Ocean Springs, Mississippi, and later evaluated in the laboratory to determine the species distribution and relative abundance. Results showed that communities in all five zones of the marsh were dominated by Schizothrix calcicola (Ag.) Gom. throughout the year and subdominants varied seasonally. In all zones, the number of individuals was greatest in the summer and lowest in winter. Examining structure of the five edaphic communities indicated a single, nearly homogeneous community exists over the entire marsh surface which is shaded by an angiosperm canopy. Light intensity appears to be the major factor affecting distribution. GRA

N79-19668# North Carolina State Univ., Raleigh. Dept. of Zoology.

BACTERIA IN A NORTH CAROLINA SALT MARSH. STANDING CROP AND IMPORTANCE IN THE DECOMPOSITION OF SPARTINA ALTERNIFLORA

Parke A. Rublee, Leon M. Cammen, and John E. Hobbie Aug. 1978 89 p refs

(Grant NOAA-04-6-158-44054)

(PB-288816/2; UNC-SG-78-11; NOAA-78102607) Avail: NTIS HC A05/MF A01 CSCL 06M

The number of bacteria in sediments of a North Carolina salt marsh was determined by direct counts with epifluorescent illumination and acridine orange stain. The number and size of bacteria at four depths in the marsh were monitored by direct counts for thirteen months. Mean yearly estimates for standing crop indicated that bacteria contribute about 36% of the microbial carbon in surface sediments by only 0.6% of total organic carbon and about 1.5% of total nitrogen. Bacteria are the major constituent of total microbial carbon at depth in the sediment. GRA

N79-19670 Stanford Univ., Calif.
HUMAN CIRCADIAN PHYSIOLOGY: INTERNAL ORGANIZATION OF TEMPERATURE, SLEEP-WAKE AND NEUROENDOCRINE RHYTHMS MONITORED IN AN ENVIRONMENT FREE OF TIME CUES Ph.D. Thesis
Charles Andrew Czeisler 1978 376 p
Avail: Univ. Microfilms Order No. 7905838

The purpose of this experiment was to study several variables which express rhythmicity in man and which also play a very important role in human physiology, in order to gain a better understanding of the interaction and interrelationships between these functions under a variety of environmental conditions. Multiple circadian rhythms were monitored in 11 human subjects living in an environment free of time cues for a period of two weeks to 3.5 months. Repetitive measurements of sleep stages, core and skin temperatures, plasma cortisol and somatotropin were carried out under entrained, free running and reentrained conditions. All eleven subjects developed free running sleep-wake rhythms greater than 24 hours, but with considerable variability in the mean period lengths and individual sleep segments.
Dissert. Abstr.

N79-19671 Purdue Univ., Lafayette, Ind.
THE RELATIONSHIP BETWEEN ADULT ARTICULAR CARTILAGE THICKNESS AND DYNAMIC LOADS OF A UNIAXIAL JOINT Ph.D. Thesis
Gerald James Pijanowski 1978 76 p
Avail: Univ. Microfilms Order No. 7905763

The uniaxial equine metacarpophalangeal joint was chosen as an appropriate model for study of this relationship. The contact areas for three positions of dorsiflexion (160 deg, 140 deg, 125 deg as measured on the extensor surface) were determined using a spatial linkage system and associated computer programs for nine joints from five adult ponies. These positions corresponded to joint loads sustained during the support (weight-bearing) phase of the walk and trot of 0.0 to 0.5 times body weight, 2.0 to 2.5 times body weight and 4.5 to 5.0 times body weight, respectively. The thickness of the uncalcified articular cartilage was measured microscopically at a number of defined points on the distal articular surface of the third metacarpal bone and the proximal articular surface of the first phalanx. The thickness of cartilage in contact was defined as the mean of the thickness of all points within the contact area. Dissert. Abstr.

N79-19672 Stanford Univ., Calif.
ESTIMATION OF NERVE-BUNDLE CONDUCTION Ph.D. Thesis
Kenneth Laurence Cummins 1978 124 p
Avail: Univ. Microfilms Order No. 7905837

A model is presented describing the nerve-bundle compound action potential (CAP) in terms of its constituent single fiber action potentials (SFAPs). The model has a general structure capable of accommodating a large variety of specific assumptions regarding the nature of the CAP. Using this model, two techniques are developed for estimating the distribution of nerve-fiber conduction velocities (CVs) in a nerve bundle. Both techniques require only noninvasive electrophysiological measurements similar to those currently in wide clinical use. When SFAP characteristics are known, a single CAP is analyzed utilizing a minimum sum-squared-error criterion for solving over-specified systems of linear equations to yield an estimate of the fiber CV distribution. The model in its most general form may be used with this method. Dissert. Abstr.

N79-19673 Purdue Univ., Lafayette, Ind.
A MATHEMATICAL SCHEME FOR PREDICTING THE ELECTRO-ACOUSTIC FREQUENCY RESPONSE OF HEARING AID RECEIVER-EARMOLD-EAR SYSTEMS Ph.D. Thesis
David Post Egolf 1976 203 p
Avail: Univ. Microfilms Order No. 7905685

As a preliminary step to attaining the desired goal, mathematical techniques were developed for analyzing the dynamics of earmold-sized acoustic transmission tubes and hearing aid receivers. The results are then incorporated into a digital computer program designed to predict sound pressure level data in real and artificial ears fitted with any receiver-earmold combination. The scheme is successfully tested on an actual receiver-earmold-artificial ear system. Universal application of the method is also demonstrated by successfully testing it on several different receiver-earmold-ear combinations, using both real and artificial ears. The same method is then used to predict electroacoustic frequency response data which is characteristic of a number of commonly-encountered cases. These include two cases of real ear pathology and numerous variations of earmold internal geometry. Dissert. Abstr.

N79-19674 Johns Hopkins Univ., Baltimore, Md.
A STUDY OF SOME OF THE FACTORS INFLUENCING THE LEFT VENTRICULAR DIASTOLIC PRESSURE-VOLUME RELATIONSHIP AND MYOCARDIAL METABOLISM Ph.D. Thesis
Douglas Francis Munch 1979 221 p
Avail: Univ. Microfilms Order No. 7906416

The effect of some of the factors which might contribute to left ventricular stiffness, such as coronary perfusion pressure or flow rate, contractility, chronotropic state, and vascular tone are examined. Also, the metabolism of isovolumic ventricular contractions is studied using a new method. A carefully designed preparation allowed close control of coronary perfusion, heart rate, ventricular volume, and inotropic state. Diastolic pressure-volume relationships were studied in isolated blood-perfused dog hearts, by stepwise changes in left ventricular balloon volume. Coronary blood flow or coronary perfusion pressure control is described. Dissert. Abstr.

N79-19675 Marquette Univ., Milwaukee, Wis.
NONINVASIVE TECHNIQUES IN THE EVALUATION OF THE PERIPHERAL CIRCULATION Ph.D. Thesis
Sergio Xavier De Salles-Cunha 1978 406 p
Avail: Univ. Microfilms Order No. 7905171

Present noninvasive techniques are compared and analyzed. The results of Doppler ultrasound and impedance methods for detection of venous thrombosis, and Doppler ultrasound for internal carotid disease are compared with angiography. Procedures for quantitative blood flow measurements in clinical applications using nuclear magnetic resonance and transcutaneous electromagnetic flowmetry (TEMF) are developed. Overviews of vascular diseases, safety of noninvasive techniques and topics of circulatory physiopathology are given. A mathematical model is developed to calculate flow through a limb or neck segment using TEMF. An analytical solution is presented for cylindrical concentric-vessel model having three-media (tissue-vessel-blood). A conformal transformation adapts this solution to the boundary conditions of an eccentric vessel model. The principle of superposition solves the problem of several vessels.
Dissert. Abstr.

N79-19676 Iowa State Univ. of Science and Technology, Ames.
MECHANICS OF BLOOD FLOW THROUGH NORMAL AND STENOTIC CORONARY ARTERIES Ph.D. Thesis
Richard Lloyd Kirkeeide 1978 187 p
Avail: Univ. Microfilms Order No. 7903988

The mechanics of blood flow through normal and stenotic coronary arteries was investigated by means of a series of in vivo experiments involving the canine left circumflex coronary artery, used in conjunction with a semi-empirical, quasi steady-flow model of the myocardial vascular bed. In addition to recorded coronary flow and aortic and left ventricular pressures, the total intravascular resistance of the myocardial vascular bed was

evaluated. The model was based upon the vascular waterfall concept of flow through collapsible tubes and allowed for predictions of dynamic coronary flow and regional distributions of intramyocardial tissue pressure, myocardial intravascular resistance and myocardial blood flow. Dissert. Abstr.

N79-19677*# General Electric Co., Houston, Tex. Space Div.
REGIONAL PROGRAM FOR ACQUISITION OF MEDICAL EXPERIMENTS Final Report
P. C. VanNordstrand 31 Oct. 1978 18 p
(Contract NAS9-15462)
(NASA-CR-160121; TIR740-RP-7006) Avail: NTIS HC A02/MF A01 CSCL 06B

A U.S. company was contracted to covering different regions of the country. A moderately detailed description of the highlights of the company activities along with some conclusions and recommendations are reported. In summary, the regional program effectively: (1) informed segments of the medical community of research opportunities; (2) validated formats for regional workshops; (3) assisted potential investigators with follow-up consultations and proposal preparations; and (4) identified a latent intersect requiring continual dialog at the scientist/engineer interface for successful cultivation and integration. G.Y.

N79-19678*# National Aeronautics and Space Administration. *Pasadena Office, Calif.*
APPARATUS FOR ENDOSCOPIC EXAMINATION Patent Application
Robert E. Frazer, inventor (to NASA) (JPL) 17 Jun. 1977 20 p Sponsored by NASA
(NASA-Case-NPO-14092-1; US-Patent-Appl-SN-807597) Avail: NTIS HC A02/MF A01 CSCL 06B

An endoscope is disclosed having a propulsion mechanism and at least one transmitter at the distal end transmitting bursts of energy waves (radio frequency or ultrasonic) for tracking the postiion of the distal end through the use of two or more transducers on the anterior or lateral surfaces of a patient. The propulsion mechanism may consist of two radially expandable bladders separated by an axially expandable bellows with only the forward bladder attached to the distal end so that by expanding and contracting them in proper sequence, propulsion of the endoscope is achieved. Alternate mechanisms comprise compliant paddles on the distal end directly on an articulated section, or compliant paddles on a rotatable sleeve on the distal end. The edoscope has a sheath which includes material having a sharp melting point slightly above body temperature so that the sheath may be made flexible at selected sections by applying current to separate heating wires in the sections of the sheath. NASA

N79-19679# Army Research Inst. of Environmental Medicine, Natick, Mass.
A COMPARISON OF THE PHYSIOLOGICAL RESPONSES IN YOUNG MEN AND WOMEN TO HEAT AND COLD STRESS
6 Oct. 1978 39 p refs
(DA Proj. 3E7-62777-A-845)
(AD-A061024; USARIEM-M-1/79) Avail: NTIS HC A04/MF A01 CSCL 06/19

The current literature on male-female differences in response to thermal stress was reviewed. Morphological differences of women (20% smaller body mass, 14% more body fat, 33% less lean body mass, but only 14-22% less surface area) impinge greatly on their relative ability to balance body heat production and losses. Women have greater body insulation against thermal transients when fully vasoconstricted (except on hands and feet) and a greater peripheral body 'shell' for a heat sink, but at the cost of (1) a greater burden of body fat to be transported, (2) less muscle mass and strength, and (3) a disproportionately smaller circulating blood volume. Women have lower blood hemoglobin concentrations, which necessitates higher cardiac output from their smaller hearts for equivalent muscular work, resulting in higher heart rates. In the heat, they generally show (1) relatively more peripheral blood pooling when vasodilated, (2) a greater increase in heart rate, (3) a greater tendency for circulatory embarrassment, (4) lower maximal sweat rates, (5) higher skin temperatures with greater body heat storage, (6) lesser ability to maintain circulating blood volume, and (7) greater effects from dehydration. Because of these differences, it is even more essential for women than men that they be given adequate time for adaptation to thermal stress and, where possible, be provided appropriate environmental protection. GRA

N79-19680# Dayton Univ. Research Inst., Ohio.
A REAL-WORLD ASSESSMENT OF NOISE EXPOSURE Final Report, 4 Nov. 1974 - 4 Nov. 1977
Thomas R. Schori and Edward A. McGatha Aug. 1978 57 p refs
(Contract F33615-75-C-5055)
(AD-A061692; UDR-TR-77-63; AMRL-TR-77-96) Avail: NTIS HC A04/MF A01 CSCL 06/19

The noise exposure of 50 individuals was continuously monitored for 7 consecutive days, by means of personal noise dosimeters. Over the 7 days of the test average Leq(24)'s (or what could be termed Leq(week)'s) among these individuals ranged from a low of 66 db to a high of 85 db, with a median of 74.7 db. Over 80 percent of the individuals had average Leq(24)'s greater than the minimum level of 70 db identified by the Environmental Protection Agency to protect public health and welfare with an adequate margin of safety (EPA 1974). Yet, with one exception, all of these individuals had average Leq(24)'s that were less than the minimum that would be exhibited by a worker who, during the working week, was exposed to the maximum level permissible under OSHA's current noise exposure regulation. Surprisingly enough, the highest average Leq(24) was not exhibited by a worker, but was exhibited by a 13 year old school boy. Author (GRA)

N79-19681# Army Research Inst. of Environmental Medicine, Natick, Mass.
INSTRUMENTATION AND TECHNIQUES FOR THE MEASUREMENT OF MUSCULAR STRENGTH AND ENDURANCE IN THE HUMAN BODY
Marcos U. Ramos and Joseph Knapik 22 Mar. 1978 29 p refs
(AD-A061023; USARIEM-M-17/78) Avail: NTIS HC A03/MF A01 CSCL 06/16

Apparatus and procedures for the measurement of isokinetic, isometric and isotonic strength of the knee and elbow extensors and flexors, plantar flexors and hand grip muscles of the intact human body is presented. Special attention is given to immobilization of the proximal body segments and the biomechanical characteristics of joint and muscle groups being measured. Estimates of the reliability of the apparatus and procedure was found to be high indicating good ability to discriminate muscle strength among subjects on the selected muscle groups. Author (GRA)

N79-19682*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRLINE PILOT SCAN PATTERNS DURING SIMULATED ILS APPROACHES
Amos A. Spady, Jr. Oct. 1978 72 p refs
(NASA-TP-1250; L-11989) Avail: NTIS HC A04/MF A01 CSCL 05J

A series of instrument landing system approaches were conducted using seven airline-rated Boeing 737 pilots in a Federal Aviation Administration qualified simulator. The test matrix included both manual and coupled approaches with and without atmospheric turbulence in Category II visibility conditions. A nonintrusive oculometer system was used to track the pilot eye-point-of-regard throughout the approach. The results indicate that, in general, the pilots use different scan techniques for the manual and coupled conditions and that the introduction of atmospheric turbulence does not greatly affect the scan behavior in either case. The pilots consistently ranked the instruments in terms of most used to least used. The ranking obtained from the oculometer data agrees with the pilot ranking for the flight director and airspeed, the most important instruments. However, the pilots apparently ranked the other instruments in terms of their concern for information rather than according to their actual scanning behavior. L.S.

N79-19683# Validated instruction Associates, Inc., Albion, Mich.
MASCULINITY, FEMININITY, ANDROGYNY. WHAT REALLY WORKS AT WORK Interim Technical Report, 1 Feb. - 30 Sep. 1978
Kirsten Hinsdale and J. David Johnson Sep. 1978 39 p refs (Contract N00014-77-C-0625)
(AD-A061177; ITR-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

To investigate the relative adaptiveness of masculinity, femininity, and androgyny in the workplace, 63 Navy personnel detailers were asked to rate the success, adjustment, and attainment they predicted for six hypothetical Navy recruits, including feminine, masculine, and androgynous recruits of each sex. 449 other Navy personnel were asked, depending on their supervisory or nonsupervisory status, to indicate the extent to which they would like to supervise or work with each recruit. It was found that the masculine personality received significantly higher ratings than the feminine personality on the variables of success, attainment, and supervisory preference. However, when compared to the androgynous personality, the masculine personality received a significantly lower rating on coworker preference, and did not differ significantly on any of the other variables. The major sex difference was seen among nonsupervisors, who preferred male to female coworkers. It is concluded that a strictly female personality is not adaptive in the workplace, but that the combination of selected masculine and feminine traits in the androgynous personality is slightly superior to the highly masculine personality. Author (GRA)

N79-19684# Allen Corp. of America, Alexandria, Va.
F-4J/N INSTRUCTIONAL SYSTEM DEVELOPMENT: PHASE 1 Final Report, May - Dec. 1977
William M. Hinton, Jr. Jul. 1978 153 p
(Contract N61339-77-C-0081)
(AD-A061098; NAVTRAEQUIPC-77-C-0081-1) Avail: NTIS HC A08/MF A01 CSCL 05/9

This project was one in a continuing series of studies to upgrade Naval aviation aircrew training programs and at the same time to study the methodology, effectiveness, and resource requirements of Instructional Systems Development (ISD). It was a Phase I effort encompassing ISD steps from hierarchy development through training support requirements analysis. Project goals were to support the Marine and Navy Fleet Readiness Squadrons in their training program development efforts and to study the utility of the 6.2 ISD model in an application to an existing aviation system. The latter goal included gathering information on the strengths and weaknesses of the model, making recommendations for modifications to the model, and collecting resource utilization data. Input data came from a validated list of pilot and RIO tasks which was furnished by the government. Tasks from this list were analyzed into a hierarchical structure of supporting skills and knowledge. This analysis formed the basis for the development of instructional objectives. Preferred and alternate media were selected for each of the objectives. Objectives were then grouped into lessons and the lessons sequenced to form the pilot and RIO syllabi. Finally, a training support requirements analysis was performed to estimate resource requirements for development, implementation, revision, and maintenance of the two training courses. Problems encountered during this program were discussed and recommendations for changes to the ISD model were presented. Author (GRA)

N79-19685 North Carolina State Univ. at Raleigh.
A MODEL FOR PREDICTING HUMAN DISCOMFORT RESPONSE TO COMBINED NOISE AND VERTICAL VIBRATION Ph.D. Thesis
Jack David Leatherwood 1978 207 p
Avail: Univ. Microfilms Order No. 7905508

The levels and frequency ranges of the noise and vibration stimuli used in this study were selected so that they approximated those encountered in various air and ground transportation systems. Results indicated that accurate prediction of passenger ride comfort requires knowledge of both the level and frequency content of the separate noise and vibration components of a ride environment as well as knowledge of the interactive effects produced by the two stressors acting in combination. Total subjective discomfort response was found to be highly dependent upon the applied levels of vibration, noise, and octave-band frequency. Maximum discomfort responses occurred for noises applied within the 63 Hz and 2000 Hz octave bands. The basic engineering design tradeoffs between passenger discomfort and noise/vibration stimulus levels were quantified by the development of a set of empirical relationships describing the interactive effects between noise level, vibration level, and octave-band frequency. Dissert. Abstr.

N79-19686*# Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
MECHANISMS OF DETERIORATION OF NUTRIENTS Annual Report, 13 Mar. 1978 - 13 May 1978
Marcus Karel and James M. Flink 1978 239 p refs
(Contract NAS9-12485)
(NASA-CR-160128) Avail: NTIS HC A11/MF A01 CSCL 06H

Methods for improving the quality of freeze-dried foods were investigated. Areas discussed include: (1) microstructure of freeze-dried systems, (2) structural changes in freeze-dried systems, (3) artificial food matrices, and (4) osmotic preconcentration to yield improved freeze-dried products. F.O.S.

N79-19687*# Rockwell International Corp., Downey, Calif. Space Div.
SIMULATED EVA OPERATION OF A REMOTE CONNECTOR ASSEMBLY TEST REPORT Final Report
A. LeFever Feb. 1979 27 p refs
(Contract NAS8-33146)
(NASA-CR-161167; SSD-79-0056) Avail: NTIS HC A03/MF A01 CSCL 05H

The features of a connector concept with respect to timelines and ease of connection by EVA (extravehicular activity), in various mating orientations were evaluated. The connector tests were conducted by thee EVA astronaut test subjects. Each of four test conditions (baseline, off angle, overhead, and with visual obstruction) were run three times by each of the test subjects. Time data were taken on each test run. Visual and voice communications with the subjects were recorded. The tests demonstrated that EVA personnel can perform connection tasks in relatively short times (generally one minute) and the connector configuration was a reasonable design base for such tasks. The in-situ communications and post-test comments indicated that the connector was generally acceptable but requires improvement to its manual interface features. G.Y.

N79-19688*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPARATUS FOR SUPPLYING CONDITIONED AIR AT A SUBSTANTIALLY CONSTANT TEMPERATURE AND HUMIDITY Patent Application
Henry D. Obler, inventor (to NASA) Filed 6 Feb. 1979 29 p
(NASA-Case-GSC-12191-1; US-Patent-Appl-SN-009886) Avail: NTIS HC A03/MF A01 CSCL 06K

An air conditioning system is described which does not require expensive and energy consuming equipment to maintain constant air temperature and humidity. A by-pass duct coupled to a supply duct selectively directs proportions of supplied and return conditioned air around a temperature reducing device. Another by-pass duct coupled to the return duct selectively directs portions of the return circulated air around both the supply duct and the temperature reducing device. A controller device selectively regulates the amount of flow and the mixing of the supplied and return conditioned air flowing through the temperature reducing device, and within the supply duct, the return duct, and the two by-pass ducts. A circulating mechanism within the supply duct moves the supply air, the return conditioned air, and the conditioned air through the various ducts. The apparatus is designed to uniformly control temperature and humidity in computer facilities. NASA

N79-19689# Sierra Engineering Co., Sierra Madre, Calif.
EVALUATION OF THE SIERRA ENGINEERING COMPANY LIGHTWEIGHT HELMET Final Report, May 1976 - Aug. 1977
Duane W. Cowgill, J. A. VanHaastert, William J. Sears (SAM), and Roger L. Stork (SAM) Jun. 1978 55 p refs
(Contract F33615-76-C-0600)
(AD-A061799; SAM-TR-78-13) Avail: NTIS HC A04/MF A01 CSCL 06/17

This report covers the advanced development of a lightweight helmet (LWH) which has recently been evaluated as a candidate for reducing the stress and strain on the neck of aircrew-members exposed to sustained high levels of positive acceleration (- G sub B). During Phase I, Sierra provided ten helmets for testing: six LWHs for the contractor-performed testing of impact and penetration resistance, acoustic attenuation, and windtunnel/antilift characteristics; and four LWHs for USAF-conducted assessments relevant to fit, maintainability, retention/pressure breathing, fixed visual fields, altitude, thermal, acceleration, voice communications effectiveness, chemical-defense equipment, and cockpit compatibility. The HGU-26/P was used as the basis for comparison. During these evaluations, problems were noted in the areas of mask retention, which in turn caused difficulties with pressure breathing and mask slippage during -Gz and fit, which led to visor/spectacle interference and visor/mask incompatibility. During Phase II Sierra provided twenty helmets for flight testing at Nellis AFB in the AIMVAL/ACEVAL program. These helmets were flown in both F-5 and F-15 aircraft. During these evaluations, problems were noted in the areas of liner comfort, chinstrap comfort, and integration with full-length bayonets. Although the helmet was not found acceptable from a comfort/fitting standpoint, the louvered visor cover and flattened side portions of the shell, which reduced aerodynamic lift, were considered a major advance in helmet design. This was in addition to the lower profile, improved peripheral vision, and excellent stability under high G. GRA

N79-19690# Dayton Univ. Research Inst., Ohio.
PHOTOMETRIC METHODS FOR THE ANALYSIS OF HUMAN KINEMATIC RESPONSES TO IMPACT ENVIRONMENTS Final Report, 25 Jun. 1973 - 30 Nov. 1976
P. A. Graf, H. T. Mohlman, and R. C. Reboulet Oct. 1978 248 p
(Contract F33615-73-C-4157; AF Proj. 7231)
(AD-A062006; UDRI-TR-76-88; AMRL-TR-78-94) Avail: NTIS HC A11/MF A01 CSCL 05/5

This report presents the processes, procedures, and techniques developed to evaluate the biodynamic response of body segments to laboratory simulations of aircraft crash and escape system environments. These simulations were conducted on the test facilities, principally the Vertical Drop Tower, the Horizontal Impulse Accelerator, and the Square Wave Impact System, located at the Aerospace Medical Research Laboratory, Impact Branch (presently known as Biomechanical Protection Branch), Wright-Patterson Air Force Base, Ohio, by personnel of that Branch. The processes described were developed to determine the time histories of coordinate locations of anthropometric points during the impact and immediately post impact phases during which the anthropometric points demonstrated planar or nonplanar motion. Coordinate systems were defined for each of the various test facilities. Reference points were marked with fiducials and their coordinates were surveyed. Body segments of the subjects were defined by fiducials affixed to anthropometric points which were measured prior to each test. The tracks of these points were recorded on high speed (500 fps) 16mm motion picture cameras throughout each test event. The film frame coordinates of the points were digitized and electronically processed to define the time-seat coordinate position history of the motion for linear and angular displacement, velocity, and acceleration analysis.
Author (GRA)

N79-19691# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
A METHODOLOGY FOR CONDUCTING HUMAN FACTORS EVALUATIONS OF VEHICLES IN OPERATIONAL FIELD TESTS Final Report
John A. Hicks, III Aug. 1978 47 p refs
(AD-A061808; ARI-RR-1200) Avail: NTIS HC A03/MF A01 CSCL 05/5

The purpose was to develop a standardized methodology for use in conducting human factors evaluations of trucks and similar vehicles within the context of operational field tests. The focus is on the assessment of users' (drivers') judgments and allows for differential weighting of individual human factors characteristics. The key to the methodology is the Human Factors Vehicular Evaluation Instrument, which is an interview form containing 85 human factors characteristics relevant to vehicle design and operation. Data are presented from the initial utilization of the methodology in an operational field test. Author (GRA)

N79-19692# National Highway Traffic Safety Administration, East Liberty, Ohio. Engineering Test Facility.
CALIBRATION OF THREE YEAR OLD CHILD DUMMIES Final Report, Feb. - May 1978
Anthony R. Bayer, Jr. and Robert W. Lum May 1978 382 p
(PB-288961/6; OCW-278/1; DOT-HS-803530) Avail: NTIS HC A17/MF A01 CSCL 13F

Tests were performed to develop appropriate calibration procedures to measure the dynamic response of a three-year-old dummy using acceleration measurements. The calibration procedure consisted of four parts: head impact tests, chest impact tests, head-neck-pendulum tests, and lumbar spine flexion tests. The data from the head impact test, head-neck-pendulum tests and the lumbar spine flexion tests gave repeatable data. The data from the chest impacts were inconsistent. GRA

N79-19985# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF HUMAN ADAPTION TO SPACEFLIGHT
O. G. Gazenko *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 61 (JPRS-72988) 13 Mar. 1979 p 23-30 Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 1, 1979 p 17-21
Copyright. Avail: NTIS HC A04/MF A01

Data obtained from manned space flights shows that space flight conditions and factors change the physiological state of the human body. However, these changes are of an adaptive character, and, for the time being, there is no serious basis for regarding them as disease processes. The adaptive process has several stages and evidently the establishment of a new, relatively stable functional level is achieved within 1 to 1.5 months from the onset of flight. In adapting to space conditions, the body uses its reserve capabilities and restructures its functions. The principal effects of weightlessness on physiological functions are caused by a change in the sensing sphere of man, absence of hydrostatic blood pressure, and the absence of a weight load on the muscles and skeletons. Means must be developed for safeguarding health by eliminating the deconditioning of the cardiovascular system, orthostatic instability, functional atrophy of the muscles, negative calcium balance, and general weakness. Possible genetic effects of prolonged space flights will be of a random, rather than a cosmic nature. A.R.H.

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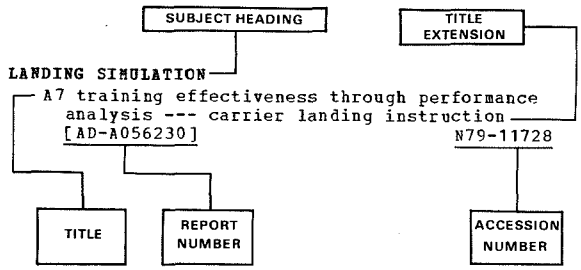

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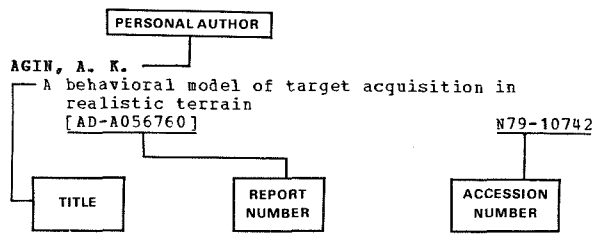

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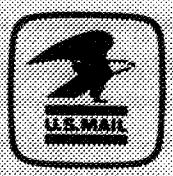

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